

Assignment 3: Data Exploration

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OVERVIEW

This exercise accompanies the lessons in Environmental Data Analytics on Data Exploration.

Directions

1. Rename this file `<FirstLast>_A03_DataExploration.Rmd` (replacing `<FirstLast>` with your first and last name).
2. Change “Student Name” on line 3 (above) with your name.
3. Work through the steps, **creating code and output** that fulfill each instruction.
4. Assign a useful **name to each code chunk** and include ample **comments** with your code.
5. Be sure to **answer the questions** in this assignment document.
6. When you have completed the assignment, **Knit** the text and code into a single PDF file.
7. After Knitting, submit the completed exercise (PDF file) to the dropbox in Sakai.

TIP: If your code extends past the page when knit, tidy your code by manually inserting line breaks.

TIP: If your code fails to knit, check that no `install.packages()` or `View()` commands exist in your code.

Set up your R session

1. Check your working directory, load necessary packages (tidyverse, lubridate), and upload two datasets: the ECOTOX neonicotinoid dataset (ECOTOX_Neonicotinoids_Insects_raw.csv) and the Niwot Ridge NEON dataset for litter and woody debris (NEON_NIWO_Litter_massdata_2018-08_raw.csv). Name these datasets “Neonics” and “Litter”, respectively. Be sure to include the subcommand to read strings in as factors.

```
#set working directory
#setwd('/Users/aileen/Desktop/Duke/Environmental_Data_Analytics/EDA_Spring_2023_corrected')
getwd()
```

```
## [1] "/Users/aileen"
```

```
#load necessary packages
library(tidyverse)
library(lubridate)
library(dplyr)
```

```
library(RColorBrewer)
library(ggplot2)

#upload datasets and set as factors
Neonics <- read.csv("./Data/Raw/ECOTOX_Neonicotinoids_Insects_raw.csv")
Litter <- read.csv("./Data/Raw/NEON_NIWO_Litter_massdata_2018-08_raw.csv")
```

Learn about your system

2. The neonicotinoid dataset was collected from the Environmental Protection Agency's ECOTOX Knowledgebase, a database for ecotoxicology research. Neonicotinoids are a class of insecticides used widely in agriculture. The dataset that has been pulled includes all studies published on insects. Why might we be interested in the ecotoxicology of neonicotinoids on insects? Feel free to do a brief internet search if you feel you need more background information.

Answer: Neonicotinoids are one of the most commonly used insecticides in the U.S. Researchers have attributed to the loss of pollinators in the U.S. to the use of neonicotinoids. We would be interested in the ecotoxicology of neonicotinoids on insects because it can give us a better understanding on the mechanisms behind colony-collapse disorder and other diseases to pollinators. Ultimately, the loss of pollinators means the loss of crops but also the possible loss of natural biodiversity of flowering plants.

3. The Niwot Ridge litter and woody debris dataset was collected from the National Ecological Observatory Network, which collectively includes 81 aquatic and terrestrial sites across 20 ecoclimatic domains. 32 of these sites sample forest litter and woody debris, and we will focus on the Niwot Ridge long-term ecological research (LTER) station in Colorado. Why might we be interested in studying litter and woody debris that falls to the ground in forests? Feel free to do a brief internet search if you feel you need more background information.

Answer: Studying the litter and woody debris that falls to the ground in forests is important because these substrates act as habitat for insects and are key to carbon cycling. Understanding the quantity of habitat for insects might be important for integrating the ecotoxicity data. Additionally, woody debris data may be used to estimate annual Aboveground Net Primary Productivity (ANPP) and aboveground biomass at plot, site, and continental scales.

4. How is litter and woody debris sampled as part of the NEON network? Read the NEON_Litterfall_UserGuide.pdf document to learn more. List three pieces of salient information about the sampling methods here:

Answer: 1. Litter and fine woody debris are collected from elevated and ground traps 2. Mass data for each collection event are measured separately for the following functional groups, to an accuracy of 0.01 grams. 3. Trap placement within plots may be either targeted or randomized, depending on the vegetation.

Obtain basic summaries of your data (Neonics)

5. What are the dimensions of the dataset? > Answer: 4623 rows, 30 columns

```
#Get dimensions of ECOTOX neonicotinoid dataset
##Rows, columns
dim(Neonics)
```

```
## [1] 4623 30
```

6. Using the `summary` function on the “Effect” column, determine the most common effects that are studied. Why might these effects specifically be of interest?

```
#creating new function to convert characters to factors
Neonicsnew <-Neonics%>%
  mutate_all(as.factor)
#using summary command on Neonicsnew
summary(Neonicsnew$Effect)
```

```
##      Accumulation      Avoidance      Behavior      Biochemistry
##           12           102           360           11
##      Cell(s)      Development      Enzyme(s) Feeding behavior
##           9           136           62           255
##      Genetics      Growth      Histology      Hormone(s)
##          82           38           5           1
## Immunological      Intoxication      Morphology      Mortality
##          16           12           22           1493
##      Physiology      Population      Reproduction
##           7           1803           197
```

```
##looking at kinds of population effects
summary(Neonicsnew$Effect.Measurement)
```

```
##      Abundance
##          1699
##      Mortality
##          1294
##      Survival
##          133
##      Progeny counts/numbers
##          120
##      Food consumption
##          103
##      Emergence
##          98
##      Search/explore/forage behavior
##          96
##      Feeding behavior, general
##          92
##      Chemical avoidance
##          65
##      Weight
##          48
##      Distance moved, change in direct movement
##          38
##      Feeding behavior
##          36
##      Flying behavior
##          30
##      Accuracy of learned task, performance
```

##	28
##	Sex ratio
##	27
##	Fecundity
##	26
##	Stimulus avoidance
##	26
##	Righting response
##	24
##	Lifespan
##	23
##	Acquired task
##	22
##	Hatch
##	21
##	Predatory behavior
##	21
##	Acetylcholinesterase
##	20
##	Walk
##	19
##	Freezing behavior
##	18
##	Reproductive success (general)
##	17
##	Slowed, Retarded, Delayed or Non-development
##	17
##	Grooming
##	16
##	Diameter
##	14
##	Residue
##	12
##	Activity, general
##	11
##	Food avoidance
##	11
##	Control
##	9
##	Developmental changes, general
##	9
##	Intrinsic rate of increase
##	9
##	Pollen collected
##	9
##	Size
##	9
##	Esterase
##	8
##	Intoxication, general
##	8
##	Mortality/survival, general
##	8
##	Population change (change in N/change in time)

##		8
##	Smell/Sniff	
##		8
##	Biomass	
##		7
##	Catalase mRNA	
##		7
##	Generation time	
##		7
##	Infected	
##		7
##	Orientation	
##		7
##	Population doubling time	
##		7
##	Population growth rate	
##		7
##	Sealed brood	
##		7
##	Vitellogenin mRNA	
##		7
##	Ali esterase	
##		6
##	Apoptosis, programmed cell death, DNA fragmentation	
##		6
##	Carboxylesterase	
##		6
##	Hemocyte	
##		6
##	Knockdown	
##		6
##	Viability	
##		6
##	Extinction	
##		5
##	Net Reproductive Rate	
##		5
##	Polyphenol oxidase	
##		5
##	Prey penetration	
##		5
##	Pupation	
##		5
##	Reproducing organisms	
##		5
##	Amount or percent animals infested with parasites	
##		4
##	Continual reinforcement task performed	
##		4
##	Defensin 1 mRNA	
##		4
##	Diversity, Evenness	
##		4
##	Encapsulation or Melanization Response	

##		4
##	General biochemical effect	
##		4
##	Glutathione S-transferase	
##		4
##	Histological changes, general	
##		4
##	Life expectancy	
##		4
##	Thioredoxin peroxidase mRNA	
##		4
##	Vanin-like protein 1-like mRNA	
##		4
##	Bees wax produced	
##		3
##	Behavioral changes, general	
##		3
##	Catalase	
##		3
##	Cell turnover	
##		3
##	Cytochrome P-450	
##		3
##	Feeding time	
##		3
##	Length	
##		3
##	Protein, total	
##		3
##	Respiration	
##		3
##	Response time to a stimulus	
##		3
##	Stage	
##		3
##	Time to first progeny	
##		3
##	Trehalase mRNA	
##		3
##	Alkaline phosphatase	
##		2
##	Carboxylesterase clade I, member 1 mRNA	
##		2
##	Contractin mRNA	
##		2
##	Chitinase 5 mRNA	
##		2
##	Colony maintenance (bees)	
##		2
##	COX2 mRNA	
##		2
##	Endoplasmic-like mRNA	
##		2
##	Gamete production	

```
##                                2
##          Glucose dehydrogenase 2 mRNA
##                                2
##          Glucosinolate sulphatase mRNA
##                                2
##          Glutathione peroxidase-like 1 mRNA
##                                2
##          Glutathione peroxidase-like 2 mRNA
##                                2
##                                (Other)
##                                77
```

Answer: Population effects (1803 occurrences) and mortality (1493 occurrences) were the greatest effects of the neonicotinoids. More specially in the population effects, abundance and mortality were the most common effects (1699 and 1294 occurrences respectively). It is important to understand how common mortality is as result of Neonicotinoids, because it can indicate the non-selective nature of the insecticide and the severity of the insecticide on pollinators and other insects that provide ecosystem services.

- Using the `summary` function, determine the six most commonly studied species in the dataset (common name). What do these species have in common, and why might they be of interest over other insects? Feel free to do a brief internet search for more information if needed. [TIP: The `sort()` command can sort the output of the summary command...]

```
#Summary of common name column of the dataset variables defined as factors
summary(Neonicsnew$Species.Common.Name)
```

```
##          Honey Bee          Parasitic Wasp
##          667          285
## Buff Tailed Bumblebee  Carniolan Honey Bee
##          183          152
##          Bumble Bee      Italian Honeybee
##          140          113
##          Japanese Beetle  Asian Lady Beetle
##          94          76
##          Euonymus Scale    Wireworm
##          75          69
##          European Dark Bee Minute Pirate Bug
##          66          62
##          Asian Citrus Psyllid  Parastic Wasp
##          60          58
##          Colorado Potato Beetle  Parasitoid Wasp
##          57          51
##          Erythrina Gall Wasp      Beetle Order
##          49          47
## Snout Beetle Family, Weevil  Sevenspotted Lady Beetle
##          47          46
##          True Bug Order      Buff-tailed Bumblebee
##          45          39
##          Aphid Family        Cabbage Looper
##          38          38
##          Sweetpotato Whitefly  Braconid Wasp
##          37          33
```

##	Cotton Aphid	Predatory Mite
##	33	33
##	Ladybird Beetle Family	Parasitoid
##	30	30
##	Scarab Beetle	Spring Tiphia
##	29	29
##	Thrip Order	Ground Beetle Family
##	29	27
##	Rove Beetle Family	Tobacco Aphid
##	27	27
##	Chalcid Wasp	Convergent Lady Beetle
##	25	25
##	Stingless Bee	Spider/Mite Class
##	25	24
##	Tobacco Flea Beetle	Citrus Leafminer
##	24	23
##	Ladybird Beetle	Mason Bee
##	23	22
##	Mosquito	Argentine Ant
##	22	21
##	Beetle	Flatheaded Appletree Borer
##	21	20
##	Horned Oak Gall Wasp	Leaf Beetle Family
##	20	20
##	Potato Leafhopper	Tooth-necked Fungus Beetle
##	20	20
##	Codling Moth	Black-spotted Lady Beetle
##	19	18
##	Calico Scale	Fairyfly Parasitoid
##	18	18
##	Lady Beetle	Minute Parasitic Wasps
##	18	18
##	Mirid Bug	Mulberry Pyralid
##	18	18
##	Silkworm	Vedalia Beetle
##	18	18
##	Araneoid Spider Order	Bee Order
##	17	17
##	Egg Parasitoid	Insect Class
##	17	17
##	Moth And Butterfly Order	Oystershell Scale Parasitoid
##	17	17
##	Hemlock Woolly Adelgid Lady Beetle	Hemlock Woolly Adelgid
##	16	16
##	Mite	Onion Thrip
##	16	16
##	Western Flower Thrips	Corn Earworm
##	15	14
##	Green Peach Aphid	House Fly
##	14	14
##	Ox Beetle	Red Scale Parasite
##	14	14
##	Spined Soldier Bug	Armoured Scale Family
##	14	13

##	Diamondback Moth	Eulophid Wasp
##	13	13
##	Monarch Butterfly	Predatory Bug
##	13	13
##	Yellow Fever Mosquito	Braconid Parasitoid
##	13	12
##	Common Thrip	Eastern Subterranean Termite
##	12	12
##	Jassid	Mite Order
##	12	12
##	Pea Aphid	Pond Wolf Spider
##	12	12
##	Spotless Ladybird Beetle	Glasshouse Potato Wasp
##	11	10
##	Lacewing	Southern House Mosquito
##	10	10
##	Two Spotted Lady Beetle	Ant Family
##	10	9
##	Apple Maggot	(Other)
##	9	670

Answer: The most common species studied were the honey bee (667), the Parasitic Wasp (285), Buff Tailed Bumblebee (183), Carniolan Honey Bee (152), Bumble Bee (140), and the Italian Honeybee (113). Bees and wasps are related as they are both in the order Hymenoptera. All of the insects in this order are winged. Additionally all bees and social wasps pollinate flowers, can both sting and build nests. These species are of special interests to humans because we rely on pollinators for our crops, flowers and overall ecosystem health. Other insects do different ecosystem services, but a insecticide that results in the loss of pollinators will be detrimental to crop yields.

8. Concentrations are always a numeric value. What is the class of `Conc.1..Author.` column in the dataset, and why is it not numeric?

```
#class function to determine data type of "Conc.1..Author." column
class("Conc.1..Author.")
```

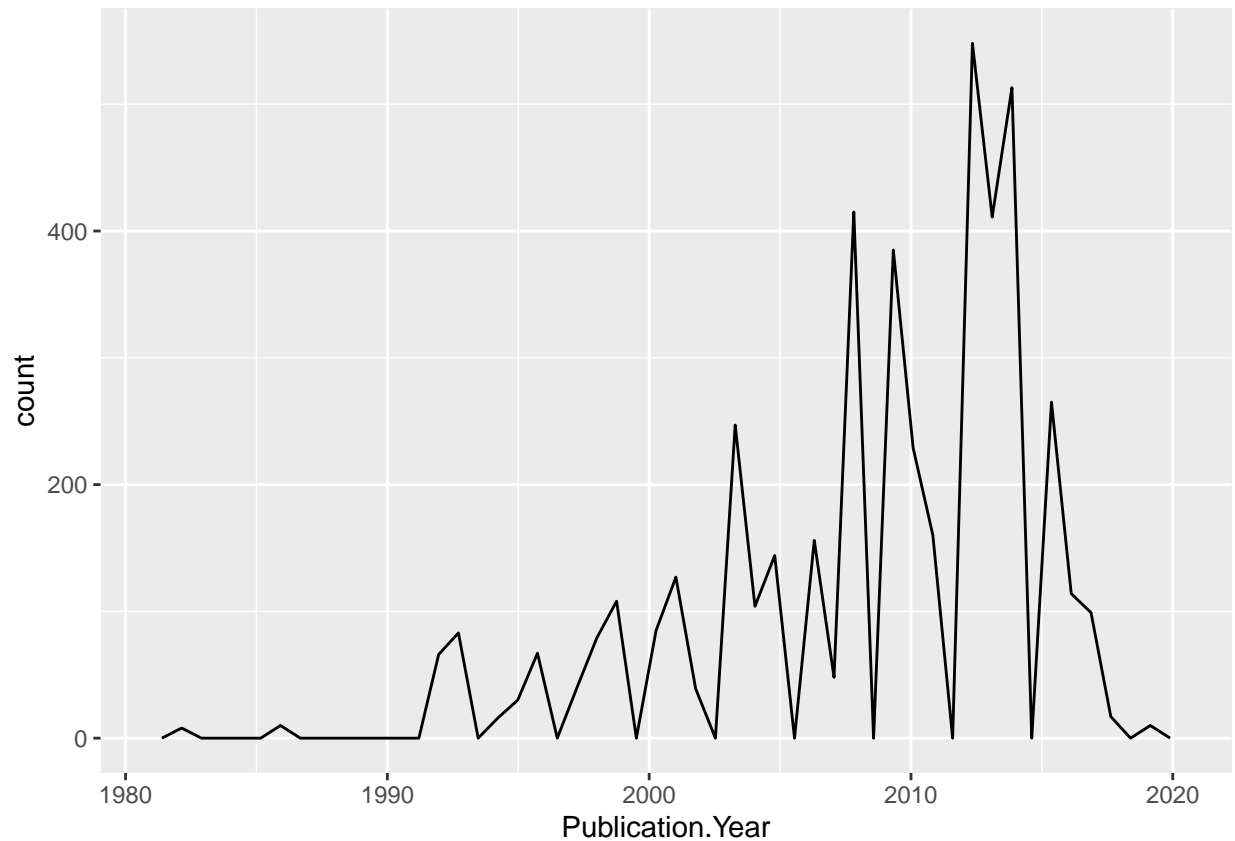
```
## [1] "character"
```

Answer: The `Conc.1..Author.` column is a character class. This column is not numeric because this is a qualitative variable describing the kind of concentration type of the chemical applied.

Explore your data graphically (Neonics)

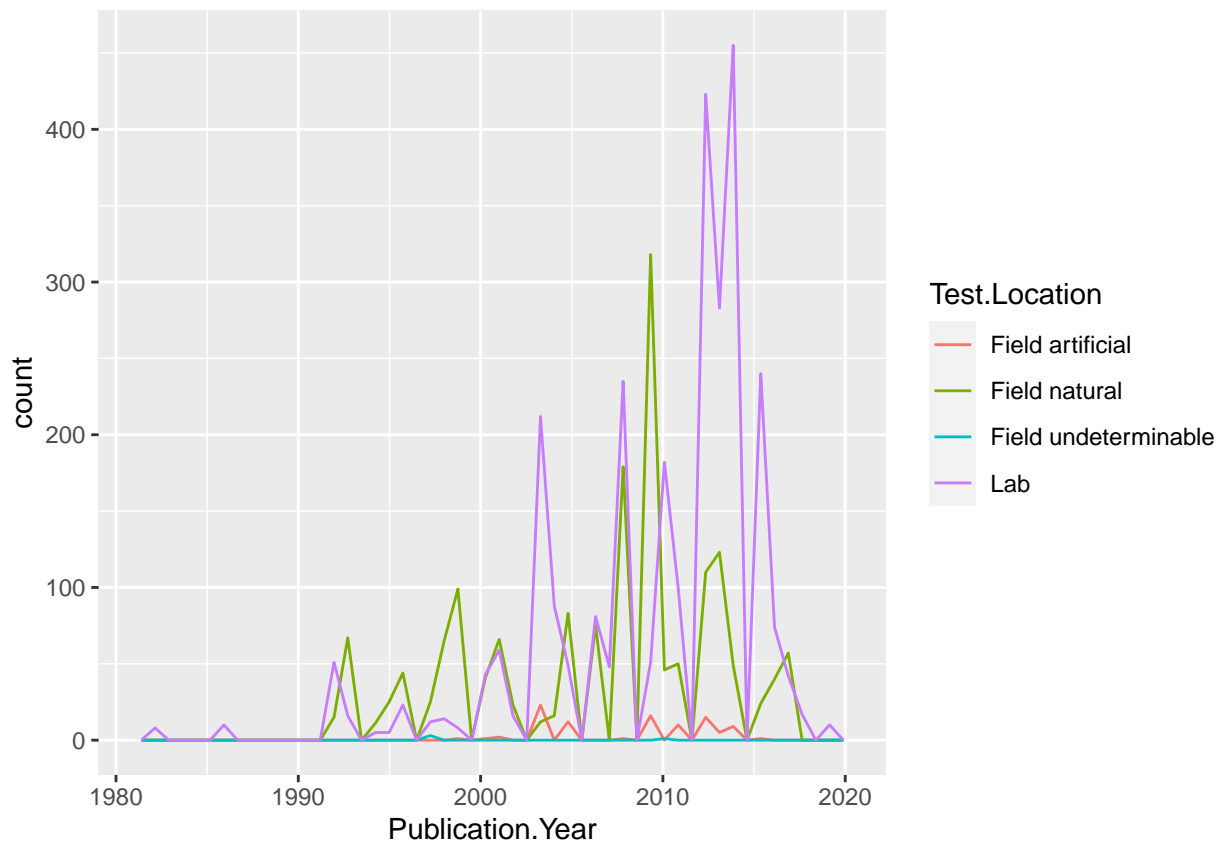
9. Using `geom_freqpoly`, generate a plot of the number of studies conducted by publication year.

```
#Creating a plot of number of studies by publication year
ggplot(Neonics) +
  geom_freqpoly(aes(x = Publication.Year), bins=50)
```



10. Reproduce the same graph but now add a color aesthetic so that different Test.Location are displayed as different colors.

```
#checking NAs
#is.na(Neonics$Test.Location)
#Removing NAs
NeonicsComplete <- na.omit(Neonics$Test.Location)
#Plot Neonics with Publication.Year and Test.Location in different colors
ggplot(Neonics) + geom_freqpoly(aes(x = Publication.Year, color = Test.Location), bins=50)
```



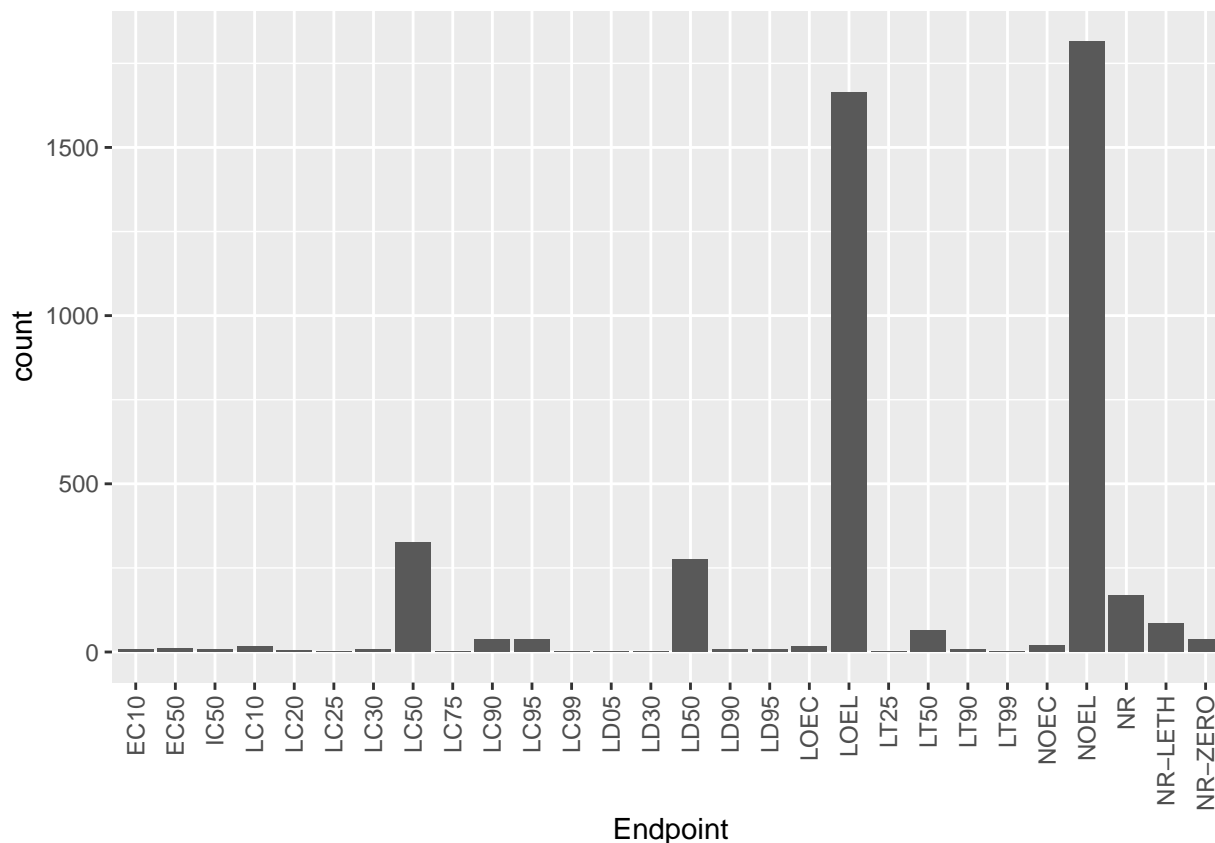
Interpret this graph. What are the most common test locations, and do they differ over time?

Answer: The most common test location is the lab from 2000-2005 and 2010-2020, inbetween these times in the study, the field natural was the most common from 2005-2010 as well as earlier in the study from the mid 1990s to 2000.

11. Create a bar graph of Endpoint counts. What are the two most common end points, and how are they defined? Consult the ECOTOX_CodeAppendix for more information.

[TIP: Add `theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust=1))` to the end of your plot command to rotate and align the X-axis labels...]

```
#Plot Endpoint Counts
ggplot(Neonicsnew, aes(x = Endpoint)) +
  geom_bar() + theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust=1))
```



Answer: The most common end points are NOEL and LOEL. NOEL is no-observable-effect-level: highest dose (concentration) producing effects not significantly different from responses of controls according to author's reported statistical test. LOEL is lowest-observable-effect-level: lowest dose (concentration) producing effects that were significantly different (as reported by authors) from responses of controls.

Explore your data (Litter)

- Determine the class of collectDate. Is it a date? If not, change to a date and confirm the new class of the variable. Using the `unique` function, determine which dates litter was sampled in August 2018.

```
#check data class
class(Litter$collectDate)

## [1] "character"

#character is the output
#Convert to date
Litter$collectDate <- as.Date(Litter$collectDate, format = "%y/%m/%d")
#Check that it is now a date
class(Litter$collectDate)

## [1] "Date"
```

```

#Fix earlier dates with create.early.dates function
create.early.dates <- (function(d) {
  paste0(ifelse(d > 191226,"19","20"),d)
})
#combinig previous function with fixing earlier dates
Litter$collectDate <- create.early.dates(Litter$collectDate)
#Check dates
summary(Litter$collectDate <- as.Date(Litter$collectDate, format = "%Y%m%d"))

```

```

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.     NA's
##      NA      NA      NA    "NaN"     NA      NA     "188"

```

```

#use unique function to look at August 2018
unique(Litter)

```

```

##                                uid          namedLocation domainID siteID
## 1  7f065fec-bcb2-4af9-b742-8e520fab7f6e NIWO_061.basePlot.ltr      D13  NIWO
## 2  88df210b-1445-4c3f-b19e-5dabd9305c6e NIWO_061.basePlot.ltr      D13  NIWO
## 3  7f3c549c-1dfa-43bf-a485-c7c2bcb31fd6 NIWO_061.basePlot.ltr      D13  NIWO
## 4  97806ab5-42d2-49c0-8463-db48cd5eab12 NIWO_061.basePlot.ltr      D13  NIWO
## 5  9d7c89f5-85f8-47b6-b415-1ae208580e6f NIWO_061.basePlot.ltr      D13  NIWO
## 6  6ca7a3e8-4d9e-4062-91a0-845f23b5b925 NIWO_061.basePlot.ltr      D13  NIWO
## 7  a0f02718-2a8e-4f02-beaa-edac27ab1b74 NIWO_061.basePlot.ltr      D13  NIWO
## 8  500eb7f8-1881-4a10-bd41-cce84f3b3c47 NIWO_061.basePlot.ltr      D13  NIWO
## 9  aa0ce5fb-6c8f-42cb-a325-f8c6ab214cff NIWO_064.basePlot.ltr      D13  NIWO
## 10 a588a308-b670-4f07-8040-6980d6cfd72 NIWO_064.basePlot.ltr      D13  NIWO
## 11 9df0737f-67f3-4d29-a1ec-8eab4ebc2726 NIWO_064.basePlot.ltr      D13  NIWO
## 12 53ec9ef3-bd18-4712-9517-4132649cafe7 NIWO_064.basePlot.ltr      D13  NIWO
## 13 57f5c94c-1655-4ea8-a492-64a660c26803 NIWO_064.basePlot.ltr      D13  NIWO
## 14 65134dbe-0a9d-446c-a600-4740f396c201 NIWO_064.basePlot.ltr      D13  NIWO
## 15 be43eacf-16e0-4f2b-b928-2bbf0de2f3c1 NIWO_064.basePlot.ltr      D13  NIWO
## 16 836b268d-5e2f-4781-8457-b7b622d13ccd NIWO_064.basePlot.ltr      D13  NIWO
## 17 0fc3a175-47a1-4bd3-9158-96d0ec3815f9 NIWO_067.basePlot.ltr      D13  NIWO
## 18 c9bb4c46-d98f-45de-9f17-8a2c608dfe79 NIWO_067.basePlot.ltr      D13  NIWO
## 19 4e6bbdd4-3151-4a05-8b77-f5757b11531b NIWO_067.basePlot.ltr      D13  NIWO
## 20 ebf1432e-c43e-48c1-ad32-ae4ce423808b NIWO_067.basePlot.ltr      D13  NIWO
## 21 9feeb756-46f9-4bf0-8e94-f2e856728889 NIWO_067.basePlot.ltr      D13  NIWO
## 22 edbee742-9d18-4c23-a097-d695a23a4e30 NIWO_067.basePlot.ltr      D13  NIWO
## 23 1537c343-14f2-4a75-b91d-c827dd529b55 NIWO_067.basePlot.ltr      D13  NIWO
## 24 e101681f-57df-44ca-8d24-b14496813e8c NIWO_067.basePlot.ltr      D13  NIWO
## 25 07780a1e-8af9-4b8a-bb9b-be8add15a1e0 NIWO_040.basePlot.ltr      D13  NIWO
## 26 4bca72cc-6f04-480b-95c9-4f55345f32bd NIWO_040.basePlot.ltr      D13  NIWO
## 27 b0be64dc-fb65-41e6-b9fa-30201c94606b NIWO_040.basePlot.ltr      D13  NIWO
## 28 6856b517-6d05-403c-893a-3dd8a7b30bff NIWO_040.basePlot.ltr      D13  NIWO
## 29 ba9800b5-b01d-4ad3-87fb-1e512c8dc17d NIWO_040.basePlot.ltr      D13  NIWO
## 30 f1a1cf1e-1f74-4500-81e3-d179dabed35c NIWO_040.basePlot.ltr      D13  NIWO
## 31 acf36093-4706-4dcb-be8c-d4d3a845548f NIWO_040.basePlot.ltr      D13  NIWO
## 32 1475c9b3-a732-4617-bffa-406b072d382e NIWO_040.basePlot.ltr      D13  NIWO
## 33 0f34060c-fc8a-4c8c-bd71-5836e9bbfb05 NIWO_040.basePlot.ltr      D13  NIWO
## 34 c1b97ed7-ff4e-4982-9e61-a41d0ab8cbbd NIWO_040.basePlot.ltr      D13  NIWO
## 35 f7577092-93be-4a42-9157-f2ee2b12318f NIWO_041.basePlot.ltr      D13  NIWO
## 36 99709f0e-3989-412e-a80d-6987d2ac54e9 NIWO_041.basePlot.ltr      D13  NIWO
## 37 4920d35f-624a-45cc-9c75-dac8f9f1d9f8 NIWO_063.basePlot.ltr      D13  NIWO

```

## 38	a1afcbb7-add9-4dd5-8feb-1b0a5e295fed	NIWO_063.basePlot.ltr	D13	NIWO
## 39	9cf0463e-c60b-4619-8658-2ed071ae3dcd	NIWO_063.basePlot.ltr	D13	NIWO
## 40	73a932ba-e4c5-4ca7-9f19-8d34ef1dea5a	NIWO_063.basePlot.ltr	D13	NIWO
## 41	a94addfa-17fc-47cb-8d69-4af3903c8bec	NIWO_063.basePlot.ltr	D13	NIWO
## 42	51b709df-af0d-441c-8835-b4bf2251ac17	NIWO_041.basePlot.ltr	D13	NIWO
## 43	cb0eb445-e514-468e-bcad-b6b4ae52ccba	NIWO_041.basePlot.ltr	D13	NIWO
## 44	f7188915-7307-4a91-b71c-7e3ff38f7d0b	NIWO_041.basePlot.ltr	D13	NIWO
## 45	c5b62b0f-e753-40e0-8cf3-e78d8a2c6c8a	NIWO_041.basePlot.ltr	D13	NIWO
## 46	85a503a8-6817-4513-8a64-d780842d6947	NIWO_041.basePlot.ltr	D13	NIWO
## 47	1b049f51-fbda-4b62-83fb-652da4308f5a	NIWO_041.basePlot.ltr	D13	NIWO
## 48	3f0a9383-16f4-4197-808c-55ac449b952d	NIWO_047.basePlot.ltr	D13	NIWO
## 49	25fff36f-f181-4f62-8529-b419227909d2	NIWO_047.basePlot.ltr	D13	NIWO
## 50	ce1f0639-26a8-4a90-9df5-39549bfa412b	NIWO_047.basePlot.ltr	D13	NIWO
## 51	028eea3d-5c20-4afc-bb7e-a05bab305152	NIWO_047.basePlot.ltr	D13	NIWO
## 52	89f98b92-bbc5-4a43-a852-46db48f6b16f	NIWO_047.basePlot.ltr	D13	NIWO
## 53	fc47bdf8-99aa-4289-9158-6ebe5b4ccb06	NIWO_047.basePlot.ltr	D13	NIWO
## 54	88ae9d88-44fd-4ef3-ba99-bd5c0590b507	NIWO_047.basePlot.ltr	D13	NIWO
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## 2  NEON.LTR.NIW0061169.20180802.SDS      NEON.DOC.001710vE      Seeds
## 3  NEON.LTR.NIW0061169.20180802.WDY      NEON.DOC.001710vE  Woody material
## 4  NEON.LTR.NIW0061169.20180802.FLR      NEON.DOC.001710vE    Flowers
## 5  NEON.LTR.NIW0061169.20180802.WDY      NEON.DOC.001710vE  Woody material
## 6  NEON.LTR.NIW0061169.20180802.NDL      NEON.DOC.001710vE    Needles
## 7  NEON.LTR.NIW0061169.20180802.OTH      NEON.DOC.001710vE    Other
## 8  NEON.LTR.NIW0061169.20180802.LVS      NEON.DOC.001710vE    Leaves
## 9  NEON.LTR.NIW0064103.20180802.FLR      NEON.DOC.001710vE    Flowers
## 10 NEON.LTR.NIW0064103.20180802.WDY      NEON.DOC.001710vE  Woody material

```

## 11	NEON.LTR.NIW0064103.20180802.WDY	NEON.DOC.001710vE	Woody material
## 12	NEON.LTR.NIW0064103.20180802.LVS	NEON.DOC.001710vE	Leaves
## 13	NEON.LTR.NIW0064103.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 14	NEON.LTR.NIW0064103.20180802.OTH	NEON.DOC.001710vE	Other
## 15	NEON.LTR.NIW0064103.20180802.SDS	NEON.DOC.001710vE	Seeds
## 16	NEON.LTR.NIW0064103.20180802.NDL	NEON.DOC.001710vE	Needles
## 17	NEON.LTR.NIW0067017.20180802.LVS	NEON.DOC.001710vE	Leaves
## 18	NEON.LTR.NIW0067017.20180802.FLR	NEON.DOC.001710vE	Flowers
## 19	NEON.LTR.NIW0067017.20180802.OTH	NEON.DOC.001710vE	Other
## 20	NEON.LTR.NIW0067017.20180802.WDY	NEON.DOC.001710vE	Woody material
## 21	NEON.LTR.NIW0067017.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 22	NEON.LTR.NIW0067017.20180802.NDL	NEON.DOC.001710vE	Needles
## 23	NEON.LTR.NIW0067017.20180802.MXT	NEON.DOC.001710vE	Mixed
## 24	NEON.LTR.NIW0067017.20180802.SDS	NEON.DOC.001710vE	Seeds
## 25	NEON.LTR.NIW0040205.20180802.OTH	NEON.DOC.001710vE	Other
## 26	NEON.LTR.NIW0040205.20180802.LVS	NEON.DOC.001710vE	Leaves
## 27	NEON.LTR.NIW0040205.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 28	NEON.LTR.NIW0040205.20180802.MXT	NEON.DOC.001710vE	Mixed
## 29	NEON.LTR.NIW0040205.20180802.WDY	NEON.DOC.001710vE	Woody material
## 30	NEON.LTR.NIW0040205.20180802.NDL	NEON.DOC.001710vE	Needles
## 31	NEON.LTR.NIW0040205.20180802.FLR	NEON.DOC.001710vE	Flowers
## 32	NEON.LTR.NIW0040205.20180802.MXT	NEON.DOC.001710vE	Mixed
## 33	NEON.LTR.NIW0040205.20180802.NDL	NEON.DOC.001710vE	Needles
## 34	NEON.LTR.NIW0040205.20180802.SDS	NEON.DOC.001710vE	Seeds
## 35	NEON.LTR.NIW0041059.20180802.MXT	NEON.DOC.001710vE	Mixed
## 36	NEON.LTR.NIW0041059.20180802.SDS	NEON.DOC.001710vE	Seeds
## 37	NEON.LTR.NIW0063062.20180802.WDY	NEON.DOC.001710vE	Woody material
## 38	NEON.LTR.NIW0063062.20180802.NDL	NEON.DOC.001710vE	Needles
## 39	NEON.LTR.NIW0063062.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 40	NEON.LTR.NIW0063062.20180802.LVS	NEON.DOC.001710vE	Leaves
## 41	NEON.LTR.NIW0063062.20180802.SDS	NEON.DOC.001710vE	Seeds
## 42	NEON.LTR.NIW0041059.20180802.FLR	NEON.DOC.001710vE	Flowers
## 43	NEON.LTR.NIW0041059.20180802.NDL	NEON.DOC.001710vE	Needles
## 44	NEON.LTR.NIW0041059.20180802.WDY	NEON.DOC.001710vE	Woody material
## 45	NEON.LTR.NIW0041059.20180802.OTH	NEON.DOC.001710vE	Other
## 46	NEON.LTR.NIW0041059.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 47	NEON.LTR.NIW0041059.20180802.LVS	NEON.DOC.001710vE	Leaves
## 48	NEON.LTR.NIW0047197.20180802.LVS	NEON.DOC.001710vE	Leaves
## 49	NEON.LTR.NIW0047197.20180802.WDY	NEON.DOC.001710vE	Woody material
## 50	NEON.LTR.NIW0047197.20180802.NDL	NEON.DOC.001710vE	Needles
## 51	NEON.LTR.NIW0047197.20180802.FLR	NEON.DOC.001710vE	Flowers
## 52	NEON.LTR.NIW0047197.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 53	NEON.LTR.NIW0047197.20180802.LVS	NEON.DOC.001710vE	Leaves
## 54	NEON.LTR.NIW0047197.20180802.OTH	NEON.DOC.001710vE	Other
## 55	NEON.LTR.NIW0047197.20180802.SDS	NEON.DOC.001710vE	Seeds
## 56	NEON.LTR.NIW0051045.20180802.LVS	NEON.DOC.001710vE	Leaves
## 57	NEON.LTR.NIW0051045.20180802.OTH	NEON.DOC.001710vE	Other
## 58	NEON.LTR.NIW0051045.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 59	NEON.LTR.NIW0051045.20180802.NDL	NEON.DOC.001710vE	Needles
## 60	NEON.LTR.NIW0051045.20180802.WDY	NEON.DOC.001710vE	Woody material
## 61	NEON.LTR.NIW0051045.20180802.FLR	NEON.DOC.001710vE	Flowers
## 62	NEON.LTR.NIW0051045.20180802.SDS	NEON.DOC.001710vE	Seeds
## 63	NEON.LTR.NIW0058101.20180802.WDY	NEON.DOC.001710vE	Woody material
## 64	NEON.LTR.NIW0058101.20180802.NDL	NEON.DOC.001710vE	Needles

## 65	NEON.LTR.NIW0058101.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 66	NEON.LTR.NIW0058101.20180802.NDL	NEON.DOC.001710vE	Needles
## 67	NEON.LTR.NIW0058101.20180802.OTH	NEON.DOC.001710vE	Other
## 68	NEON.LTR.NIW0058101.20180802.FLR	NEON.DOC.001710vE	Flowers
## 69	NEON.LTR.NIW0058101.20180802.LVS	NEON.DOC.001710vE	Leaves
## 70	NEON.LTR.NIW0058101.20180802.SDS	NEON.DOC.001710vE	Seeds
## 71	NEON.LTR.NIW0058101.20180802.OTH	NEON.DOC.001710vE	Other
## 72	NEON.LTR.NIW0063062.20180802.OTH	NEON.DOC.001710vE	Other
## 73	NEON.LTR.NIW0063062.20180802.FLR	NEON.DOC.001710vE	Flowers
## 74	NEON.LTR.NIW0046155.20180802.NDL	NEON.DOC.001710vE	Needles
## 75	NEON.LTR.NIW0046155.20180802.LVS	NEON.DOC.001710vE	Leaves
## 76	NEON.LTR.NIW0046155.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 77	NEON.LTR.NIW0046155.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 78	NEON.LTR.NIW0046155.20180802.MXT	NEON.DOC.001710vE	Mixed
## 79	NEON.LTR.NIW0046155.20180802.OTH	NEON.DOC.001710vE	Other
## 80	NEON.LTR.NIW0046155.20180802.NDL	NEON.DOC.001710vE	Needles
## 81	NEON.LTR.NIW0046155.20180802.WDY	NEON.DOC.001710vE	Woody material
## 82	NEON.LTR.NIW0046155.20180802.FLR	NEON.DOC.001710vE	Flowers
## 83	NEON.LTR.NIW0046155.20180802.SDS	NEON.DOC.001710vE	Seeds
## 84	NEON.LTR.NIW0062050.20180802.SDS	NEON.DOC.001710vE	Seeds
## 85	NEON.LTR.NIW0062050.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 86	NEON.LTR.NIW0062050.20180802.FLR	NEON.DOC.001710vE	Flowers
## 87	NEON.LTR.NIW0062050.20180802.LVS	NEON.DOC.001710vE	Leaves
## 88	NEON.LTR.NIW0062050.20180802.OTH	NEON.DOC.001710vE	Other
## 89	NEON.LTR.NIW0062050.20180802.NDL	NEON.DOC.001710vE	Needles
## 90	NEON.LTR.NIW0062050.20180802.WDY	NEON.DOC.001710vE	Woody material
## 91	NEON.LTR.NIW0061169.20180802.NDL	NEON.DOC.001710vE	Needles
## 92	NEON.LTR.NIW0040205.20180830.MXT	NEON.DOC.001710vE	Mixed
## 93	NEON.LTR.NIW0041059.20180830.LVS	NEON.DOC.001710vE	Leaves
## 94	NEON.LTR.NIW0041059.20180830.NDL	NEON.DOC.001710vE	Needles
## 95	NEON.LTR.NIW0041059.20180830.FLR	NEON.DOC.001710vE	Flowers
## 96	NEON.LTR.NIW0041059.20180830.SDS	NEON.DOC.001710vE	Seeds
## 97	NEON.LTR.NIW0041059.20180830.MXT	NEON.DOC.001710vE	Mixed
## 98	NEON.LTR.NIW0041059.20180830.OTH	NEON.DOC.001710vE	Other
## 99	NEON.LTR.NIW0041059.20180830.MXT	NEON.DOC.001710vE	Mixed
## 100	NEON.LTR.NIW0041059.20180830.WDY	NEON.DOC.001710vE	Woody material
## 101	NEON.LTR.NIW0041059.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 102	NEON.LTR.NIW0041059.20180830.NDL	NEON.DOC.001710vE	Needles
## 103	NEON.LTR.NIW0041059.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 104	NEON.LTR.NIW0047197.20180830.OTH	NEON.DOC.001710vE	Other
## 105	NEON.LTR.NIW0047197.20180830.SDS	NEON.DOC.001710vE	Seeds
## 106	NEON.LTR.NIW0047197.20180830.LVS	NEON.DOC.001710vE	Leaves
## 107	NEON.LTR.NIW0047197.20180830.FLR	NEON.DOC.001710vE	Flowers
## 108	NEON.LTR.NIW0047197.20180830.NDL	NEON.DOC.001710vE	Needles
## 109	NEON.LTR.NIW0047197.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 110	NEON.LTR.NIW0047197.20180830.WDY	NEON.DOC.001710vE	Woody material
## 111	NEON.LTR.NIW0051045.20180830.SDS	NEON.DOC.001710vE	Seeds
## 112	NEON.LTR.NIW0051045.20180830.OTH	NEON.DOC.001710vE	Other
## 113	NEON.LTR.NIW0051045.20180830.NDL	NEON.DOC.001710vE	Needles
## 114	NEON.LTR.NIW0051045.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 115	NEON.LTR.NIW0051045.20180830.LVS	NEON.DOC.001710vE	Leaves
## 116	NEON.LTR.NIW0051045.20180830.WDY	NEON.DOC.001710vE	Woody material
## 117	NEON.LTR.NIW0051045.20180830.FLR	NEON.DOC.001710vE	Flowers
## 118	NEON.LTR.NIW0058101.20180830.WDY	NEON.DOC.001710vE	Woody material

## 119	NEON.LTR.NIW0058101.20180830.OTH	NEON.DOC.001710vE	Other
## 120	NEON.LTR.NIW0058101.20180830.SDS	NEON.DOC.001710vE	Seeds
## 121	NEON.LTR.NIW0058101.20180830.FLR	NEON.DOC.001710vE	Flowers
## 122	NEON.LTR.NIW0058101.20180830.NDL	NEON.DOC.001710vE	Needles
## 123	NEON.LTR.NIW0058101.20180830.LVS	NEON.DOC.001710vE	Leaves
## 124	NEON.LTR.NIW0058101.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 125	NEON.LTR.NIW0063062.20180830.SDS	NEON.DOC.001710vE	Seeds
## 126	NEON.LTR.NIW0063062.20180830.NDL	NEON.DOC.001710vE	Needles
## 127	NEON.LTR.NIW0063062.20180830.LVS	NEON.DOC.001710vE	Leaves
## 128	NEON.LTR.NIW0063062.20180830.FLR	NEON.DOC.001710vE	Flowers
## 129	NEON.LTR.NIW0063062.20180830.WDY	NEON.DOC.001710vE	Woody material
## 130	NEON.LTR.NIW0063062.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 131	NEON.LTR.NIW0063062.20180830.OTH	NEON.DOC.001710vE	Other
## 132	NEON.LTR.NIW0046155.20180830.LVS	NEON.DOC.001710vE	Leaves
## 133	NEON.LTR.NIW0046155.20180830.NDL	NEON.DOC.001710vE	Needles
## 134	NEON.LTR.NIW0046155.20180830.OTH	NEON.DOC.001710vE	Other
## 135	NEON.LTR.NIW0046155.20180830.WDY	NEON.DOC.001710vE	Woody material
## 136	NEON.LTR.NIW0046155.20180830.SDS	NEON.DOC.001710vE	Seeds
## 137	NEON.LTR.NIW0046155.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 138	NEON.LTR.NIW0046155.20180830.FLR	NEON.DOC.001710vE	Flowers
## 139	NEON.LTR.NIW0046155.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 140	NEON.LTR.NIW0062050.20180830.SDS	NEON.DOC.001710vE	Seeds
## 141	NEON.LTR.NIW0062050.20180830.FLR	NEON.DOC.001710vE	Flowers
## 142	NEON.LTR.NIW0062050.20180830.LVS	NEON.DOC.001710vE	Leaves
## 143	NEON.LTR.NIW0062050.20180830.WDY	NEON.DOC.001710vE	Woody material
## 144	NEON.LTR.NIW0062050.20180830.OTH	NEON.DOC.001710vE	Other
## 145	NEON.LTR.NIW0062050.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 146	NEON.LTR.NIW0062050.20180830.NDL	NEON.DOC.001710vE	Needles
## 147	NEON.LTR.NIW0061169.20180830.OTH	NEON.DOC.001710vE	Other
## 148	NEON.LTR.NIW0061169.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 149	NEON.LTR.NIW0061169.20180830.WDY	NEON.DOC.001710vE	Woody material
## 150	NEON.LTR.NIW0061169.20180830.FLR	NEON.DOC.001710vE	Flowers
## 151	NEON.LTR.NIW0061169.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 152	NEON.LTR.NIW0061169.20180830.SDS	NEON.DOC.001710vE	Seeds
## 153	NEON.LTR.NIW0061169.20180830.LVS	NEON.DOC.001710vE	Leaves
## 154	NEON.LTR.NIW0061169.20180830.NDL	NEON.DOC.001710vE	Needles
## 155	NEON.LTR.NIW0064103.20180830.WDY	NEON.DOC.001710vE	Woody material
## 156	NEON.LTR.NIW0064103.20180830.WDY	NEON.DOC.001710vE	Woody material
## 157	NEON.LTR.NIW0064103.20180830.LVS	NEON.DOC.001710vE	Leaves
## 158	NEON.LTR.NIW0064103.20180830.FLR	NEON.DOC.001710vE	Flowers
## 159	NEON.LTR.NIW0064103.20180830.SDS	NEON.DOC.001710vE	Seeds
## 160	NEON.LTR.NIW0064103.20180830.OTH	NEON.DOC.001710vE	Other
## 161	NEON.LTR.NIW0064103.20180830.NDL	NEON.DOC.001710vE	Needles
## 162	NEON.LTR.NIW0064103.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 163	NEON.LTR.NIW0057081.20180830.NDL	NEON.DOC.001710vE	Needles
## 164	NEON.LTR.NIW0057081.20180830.FLR	NEON.DOC.001710vE	Flowers
## 165	NEON.LTR.NIW0057081.20180830.SDS	NEON.DOC.001710vE	Seeds
## 166	NEON.LTR.NIW0057081.20180830.OTH	NEON.DOC.001710vE	Other
## 167	NEON.LTR.NIW0057081.20180830.LVS	NEON.DOC.001710vE	Leaves
## 168	NEON.LTR.NIW0057081.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 169	NEON.LTR.NIW0057081.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 170	NEON.LTR.NIW0057081.20180830.WDY	NEON.DOC.001710vE	Woody material
## 171	NEON.LTR.NIW0067017.20180830.NDL	NEON.DOC.001710vE	Needles
## 172	NEON.LTR.NIW0067017.20180830.OTH	NEON.DOC.001710vE	Other

## 173	NEON.LTR.NIW0067017.20180830.LVS	NEON.DOC.001710vE	Leaves
## 174	NEON.LTR.NIW0067017.20180830.WDY	NEON.DOC.001710vE	Woody material
## 175	NEON.LTR.NIW0067017.20180830.NDL	NEON.DOC.001710vE	Needles
## 176	NEON.LTR.NIW0067017.20180830.FLR	NEON.DOC.001710vE	Flowers
## 177	NEON.LTR.NIW0067017.20180830.SDS	NEON.DOC.001710vE	Seeds
## 178	NEON.LTR.NIW0067017.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 179	NEON.LTR.NIW0067017.20180830.MXT	NEON.DOC.001710vE	Mixed
## 180	NEON.LTR.NIW0040205.20180830.SDS	NEON.DOC.001710vE	Seeds
## 181	NEON.LTR.NIW0040205.20180830.WDY	NEON.DOC.001710vE	Woody material
## 182	NEON.LTR.NIW0040205.20180830.OTH	NEON.DOC.001710vE	Other
## 183	NEON.LTR.NIW0040205.20180830.LVS	NEON.DOC.001710vE	Leaves
## 184	NEON.LTR.NIW0040205.20180830.NDL	NEON.DOC.001710vE	Needles
## 185	NEON.LTR.NIW0040205.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 186	NEON.LTR.NIW0040205.20180830.MXT	NEON.DOC.001710vE	Mixed
## 187	NEON.LTR.NIW0040205.20180830.NDL	NEON.DOC.001710vE	Needles
## 188	NEON.LTR.NIW0040205.20180830.FLR	NEON.DOC.001710vE	Flowers
##	dryMass qaDryMass remarks	measuredBy	
## 1	0.400 N NA kstyers@battelleecology.org		
## 2	0.005 N NA kstyers@battelleecology.org		
## 3	0.040 Y NA kstyers@battelleecology.org		
## 4	0.005 N NA kstyers@battelleecology.org		
## 5	0.070 N NA kstyers@battelleecology.org		
## 6	1.000 N NA kstyers@battelleecology.org		
## 7	0.200 N NA kstyers@battelleecology.org		
## 8	0.005 N NA kstyers@battelleecology.org		
## 9	0.190 N NA kstyers@battelleecology.org		
## 10	1.180 Y NA kstyers@battelleecology.org		
## 11	1.180 N NA kstyers@battelleecology.org		
## 12	0.000 N NA kstyers@battelleecology.org		
## 13	0.005 N NA kstyers@battelleecology.org		
## 14	0.350 N NA kstyers@battelleecology.org		
## 15	0.000 N NA kstyers@battelleecology.org		
## 16	3.060 N NA kstyers@battelleecology.org		
## 17	0.000 N NA kstyers@battelleecology.org		
## 18	0.005 N NA kstyers@battelleecology.org		
## 19	0.040 N NA kstyers@battelleecology.org		
## 20	0.005 N NA kstyers@battelleecology.org		
## 21	0.005 N NA kstyers@battelleecology.org		
## 22	0.930 N NA kstyers@battelleecology.org		
## 23	0.000 N NA kstyers@battelleecology.org		
## 24	0.005 N NA kstyers@battelleecology.org		
## 25	0.000 N NA kstyers@battelleecology.org		
## 26	0.000 N NA kstyers@battelleecology.org		
## 27	0.720 N NA kstyers@battelleecology.org		
## 28	2.120 Y NA kstyers@battelleecology.org		
## 29	0.000 N NA kstyers@battelleecology.org		
## 30	3.240 N NA kstyers@battelleecology.org		
## 31	0.240 N NA kstyers@battelleecology.org		
## 32	2.170 N NA kstyers@battelleecology.org		
## 33	3.160 Y NA kstyers@battelleecology.org		
## 34	0.000 N NA kstyers@battelleecology.org		
## 35	0.170 N NA kstyers@battelleecology.org		
## 36	0.000 N NA kstyers@battelleecology.org		
## 37	0.005 N NA kstyers@battelleecology.org		

## 38	0.240	N	NA kstyers@battelleecology.org
## 39	0.060	N	NA kstyers@battelleecology.org
## 40	0.000	N	NA kstyers@battelleecology.org
## 41	0.000	N	NA kstyers@battelleecology.org
## 42	0.005	N	NA kstyers@battelleecology.org
## 43	1.790	N	NA kstyers@battelleecology.org
## 44	0.005	N	NA kstyers@battelleecology.org
## 45	0.000	N	NA kstyers@battelleecology.org
## 46	0.005	N	NA kstyers@battelleecology.org
## 47	0.005	N	NA kstyers@battelleecology.org
## 48	0.005	Y	NA kstyers@battelleecology.org
## 49	0.000	N	NA kstyers@battelleecology.org
## 50	0.030	N	NA kstyers@battelleecology.org
## 51	0.000	N	NA kstyers@battelleecology.org
## 52	0.000	N	NA kstyers@battelleecology.org
## 53	0.005	N	NA kstyers@battelleecology.org
## 54	0.005	N	NA kstyers@battelleecology.org
## 55	0.000	N	NA kstyers@battelleecology.org
## 56	0.000	N	NA kstyers@battelleecology.org
## 57	0.005	N	NA kstyers@battelleecology.org
## 58	0.050	N	NA kstyers@battelleecology.org
## 59	0.470	N	NA kstyers@battelleecology.org
## 60	0.005	N	NA kstyers@battelleecology.org
## 61	0.005	N	NA kstyers@battelleecology.org
## 62	0.000	N	NA kstyers@battelleecology.org
## 63	0.005	N	NA kstyers@battelleecology.org
## 64	1.640	N	NA kstyers@battelleecology.org
## 65	0.000	N	NA kstyers@battelleecology.org
## 66	1.670	Y	NA kstyers@battelleecology.org
## 67	0.005	N	NA kstyers@battelleecology.org
## 68	0.000	N	NA kstyers@battelleecology.org
## 69	0.000	N	NA kstyers@battelleecology.org
## 70	0.000	N	NA kstyers@battelleecology.org
## 71	0.005	Y	NA kstyers@battelleecology.org
## 72	0.005	N	NA kstyers@battelleecology.org
## 73	0.000	N	NA kstyers@battelleecology.org
## 74	3.920	Y	NA kstyers@battelleecology.org
## 75	0.000	N	NA kstyers@battelleecology.org
## 76	0.630	N	NA kstyers@battelleecology.org
## 77	0.630	Y	NA kstyers@battelleecology.org
## 78	0.090	N	NA kstyers@battelleecology.org
## 79	0.000	N	NA kstyers@battelleecology.org
## 80	3.920	N	NA kstyers@battelleecology.org
## 81	0.030	N	NA kstyers@battelleecology.org
## 82	0.020	N	NA kstyers@battelleecology.org
## 83	0.000	N	NA kstyers@battelleecology.org
## 84	0.000	N	NA kstyers@battelleecology.org
## 85	0.000	N	NA kstyers@battelleecology.org
## 86	0.000	N	NA kstyers@battelleecology.org
## 87	0.000	N	NA kstyers@battelleecology.org
## 88	0.080	N	NA kstyers@battelleecology.org
## 89	0.320	N	NA kstyers@battelleecology.org
## 90	0.005	N	NA kstyers@battelleecology.org
## 91	1.000	Y	NA kstyers@battelleecology.org

## 92	0.610	Y	NA szrillo@battelleecology.org
## 93	0.000	N	NA szrillo@battelleecology.org
## 94	8.630	Y	NA szrillo@battelleecology.org
## 95	0.005	N	NA szrillo@battelleecology.org
## 96	0.005	N	NA szrillo@battelleecology.org
## 97	1.910	Y	NA szrillo@battelleecology.org
## 98	0.000	N	NA szrillo@battelleecology.org
## 99	1.900	N	NA szrillo@battelleecology.org
## 100	0.140	N	NA szrillo@battelleecology.org
## 101	0.340	Y	NA szrillo@battelleecology.org
## 102	8.620	N	NA szrillo@battelleecology.org
## 103	0.340	N	NA szrillo@battelleecology.org
## 104	0.005	N	NA szrillo@battelleecology.org
## 105	0.000	N	NA szrillo@battelleecology.org
## 106	0.000	N	NA szrillo@battelleecology.org
## 107	0.000	N	NA szrillo@battelleecology.org
## 108	0.420	N	NA szrillo@battelleecology.org
## 109	0.000	N	NA szrillo@battelleecology.org
## 110	0.005	N	NA szrillo@battelleecology.org
## 111	0.000	N	NA szrillo@battelleecology.org
## 112	0.010	N	NA szrillo@battelleecology.org
## 113	0.900	N	NA szrillo@battelleecology.org
## 114	0.020	N	NA szrillo@battelleecology.org
## 115	0.000	N	NA szrillo@battelleecology.org
## 116	0.005	N	NA szrillo@battelleecology.org
## 117	0.000	N	NA szrillo@battelleecology.org
## 118	0.000	N	NA szrillo@battelleecology.org
## 119	0.005	N	NA szrillo@battelleecology.org
## 120	0.000	N	NA szrillo@battelleecology.org
## 121	0.030	N	NA szrillo@battelleecology.org
## 122	2.820	N	NA szrillo@battelleecology.org
## 123	0.000	N	NA szrillo@battelleecology.org
## 124	0.000	N	NA szrillo@battelleecology.org
## 125	0.000	N	NA szrillo@battelleecology.org
## 126	0.300	N	NA szrillo@battelleecology.org
## 127	0.005	N	NA szrillo@battelleecology.org
## 128	0.005	N	NA szrillo@battelleecology.org
## 129	0.000	N	NA szrillo@battelleecology.org
## 130	0.200	N	NA szrillo@battelleecology.org
## 131	0.000	N	NA szrillo@battelleecology.org
## 132	0.000	N	NA szrillo@battelleecology.org
## 133	7.000	N	NA szrillo@battelleecology.org
## 134	0.110	N	NA szrillo@battelleecology.org
## 135	0.090	N	NA szrillo@battelleecology.org
## 136	0.000	N	NA szrillo@battelleecology.org
## 137	1.050	Y	NA szrillo@battelleecology.org
## 138	0.005	N	NA szrillo@battelleecology.org
## 139	1.050	N	NA szrillo@battelleecology.org
## 140	0.005	N	NA szrillo@battelleecology.org
## 141	0.005	N	NA szrillo@battelleecology.org
## 142	0.060	N	NA szrillo@battelleecology.org
## 143	0.050	N	NA szrillo@battelleecology.org
## 144	0.090	N	NA szrillo@battelleecology.org
## 145	0.000	N	NA szrillo@battelleecology.org

```
## 146 3.980 N NA szrillo@battelleecology.org
## 147 0.110 N NA szrillo@battelleecology.org
## 148 0.060 Y NA szrillo@battelleecology.org
## 149 0.150 N NA szrillo@battelleecology.org
## 150 0.060 N NA szrillo@battelleecology.org
## 151 0.020 N NA szrillo@battelleecology.org
## 152 0.000 N NA szrillo@battelleecology.org
## 153 0.000 N NA szrillo@battelleecology.org
## 154 1.530 N NA szrillo@battelleecology.org
## 155 0.010 Y NA szrillo@battelleecology.org
## 156 0.010 N NA szrillo@battelleecology.org
## 157 0.005 N NA szrillo@battelleecology.org
## 158 0.110 N NA szrillo@battelleecology.org
## 159 0.000 N NA szrillo@battelleecology.org
## 160 0.080 N NA szrillo@battelleecology.org
## 161 2.820 N NA szrillo@battelleecology.org
## 162 0.000 N NA szrillo@battelleecology.org
## 163 4.090 N NA szrillo@battelleecology.org
## 164 0.070 N NA szrillo@battelleecology.org
## 165 0.000 N NA szrillo@battelleecology.org
## 166 0.290 N NA szrillo@battelleecology.org
## 167 0.000 N NA szrillo@battelleecology.org
## 168 5.840 N NA szrillo@battelleecology.org
## 169 5.870 Y NA szrillo@battelleecology.org
## 170 0.320 N NA szrillo@battelleecology.org
## 171 2.280 N NA szrillo@battelleecology.org
## 172 0.000 N NA szrillo@battelleecology.org
## 173 0.000 N NA szrillo@battelleecology.org
## 174 0.005 N NA szrillo@battelleecology.org
## 175 2.290 Y NA szrillo@battelleecology.org
## 176 0.005 N NA szrillo@battelleecology.org
## 177 0.000 N NA szrillo@battelleecology.org
## 178 0.150 N NA szrillo@battelleecology.org
## 179 0.070 N NA szrillo@battelleecology.org
## 180 0.005 N NA szrillo@battelleecology.org
## 181 0.980 N NA szrillo@battelleecology.org
## 182 0.000 N NA szrillo@battelleecology.org
## 183 0.000 N NA szrillo@battelleecology.org
## 184 4.550 Y NA szrillo@battelleecology.org
## 185 0.000 N NA szrillo@battelleecology.org
## 186 0.610 N NA szrillo@battelleecology.org
## 187 4.530 N NA szrillo@battelleecology.org
## 188 0.150 N NA szrillo@battelleecology.org
```

```
#August 2nd 2018, August 6th 2018, and August 30th 2018.
```

13. Using the `unique` function, determine how many plots were sampled at Niwot Ridge. How is the information obtained from `unique` different from that obtained from `summary`?

```
#Using unique function for Niwot Ridge
unique(Litter)
```

```
##                                uid      namedLocation domainID siteID
```

## 1	7f065fec-bcb2-4af9-b742-8e520fab7f6e	NIWO_061.basePlot.ltr	D13	NIWO
## 2	88df210b-1445-4c3f-b19e-5dabd9305c6e	NIWO_061.basePlot.ltr	D13	NIWO
## 3	7f3c549c-1dfa-43bf-a485-c7c2bcb31fd6	NIWO_061.basePlot.ltr	D13	NIWO
## 4	97806ab5-42d2-49c0-8463-db48cd5eab12	NIWO_061.basePlot.ltr	D13	NIWO
## 5	9d7c89f5-85f8-47b6-b415-1ae208580e6f	NIWO_061.basePlot.ltr	D13	NIWO
## 6	6ca7a3e8-4d9e-4062-91a0-845f23b5b925	NIWO_061.basePlot.ltr	D13	NIWO
## 7	a0f02718-2a8e-4f02-beaa-edac27ab1b74	NIWO_061.basePlot.ltr	D13	NIWO
## 8	500eb7f8-1881-4a10-bd41-cce84f3b3c47	NIWO_061.basePlot.ltr	D13	NIWO
## 9	aa0ce5fb-6c8f-42cb-a325-f8c6ab214cff	NIWO_064.basePlot.ltr	D13	NIWO
## 10	a588a308-b670-4f07-8040-6980d6cfd72	NIWO_064.basePlot.ltr	D13	NIWO
## 11	9df0737f-67f3-4d29-a1ec-8eab4ebc2726	NIWO_064.basePlot.ltr	D13	NIWO
## 12	53ec9ef3-bd18-4712-9517-4132649cafe7	NIWO_064.basePlot.ltr	D13	NIWO
## 13	57f5c94c-1655-4ea8-a492-64a660c26803	NIWO_064.basePlot.ltr	D13	NIWO
## 14	65134dbe-0a9d-446c-a600-4740f396c201	NIWO_064.basePlot.ltr	D13	NIWO
## 15	be43eacf-16e0-4f2b-b928-2bbf0de2f3c1	NIWO_064.basePlot.ltr	D13	NIWO
## 16	836b268d-5e2f-4781-8457-b7b622d13ccd	NIWO_064.basePlot.ltr	D13	NIWO
## 17	0fc3a175-47a1-4bd3-9158-96d0ec3815f9	NIWO_067.basePlot.ltr	D13	NIWO
## 18	c9bb4c46-d98f-45de-9f17-8a2c608dfe79	NIWO_067.basePlot.ltr	D13	NIWO
## 19	4e6bbdd4-3151-4a05-8b77-f5757b11531b	NIWO_067.basePlot.ltr	D13	NIWO
## 20	ebf1432e-c43e-48c1-ad32-ae4ce423808b	NIWO_067.basePlot.ltr	D13	NIWO
## 21	9feeb756-46f9-4bf0-8e94-f2e856728889	NIWO_067.basePlot.ltr	D13	NIWO
## 22	edbee742-9d18-4c23-a097-d695a23a4e30	NIWO_067.basePlot.ltr	D13	NIWO
## 23	1537c343-14f2-4a75-b91d-c827dd529b55	NIWO_067.basePlot.ltr	D13	NIWO
## 24	e101681f-57df-44ca-8d24-b14496813e8c	NIWO_067.basePlot.ltr	D13	NIWO
## 25	07780a1e-8af9-4b8a-bb9b-be8add15a1e0	NIWO_040.basePlot.ltr	D13	NIWO
## 26	4bca72cc-6f04-480b-95c9-4f55345f32bd	NIWO_040.basePlot.ltr	D13	NIWO
## 27	b0be64dc-fb65-41e6-b9fa-30201c94606b	NIWO_040.basePlot.ltr	D13	NIWO
## 28	6856b517-6d05-403c-893a-3dd8a7b30bff	NIWO_040.basePlot.ltr	D13	NIWO
## 29	ba9800b5-b01d-4ad3-87fb-1e512c8dc17d	NIWO_040.basePlot.ltr	D13	NIWO
## 30	f1a1cf1e-1f74-4500-81e3-d179dabed35c	NIWO_040.basePlot.ltr	D13	NIWO
## 31	acf36093-4706-4dcb-be8c-d4d3a845548f	NIWO_040.basePlot.ltr	D13	NIWO
## 32	1475c9b3-a732-4617-bffa-406b072d382e	NIWO_040.basePlot.ltr	D13	NIWO
## 33	0f34060c-fc8a-4c8c-bd71-5836e9bbfb05	NIWO_040.basePlot.ltr	D13	NIWO
## 34	c1b97ed7-ff4e-4982-9e61-a41d0ab8cbbd	NIWO_040.basePlot.ltr	D13	NIWO
## 35	f7577092-93be-4a42-9157-f2ee2b12318f	NIWO_041.basePlot.ltr	D13	NIWO
## 36	99709f0e-3989-412e-a80d-6987d2ac54e9	NIWO_041.basePlot.ltr	D13	NIWO
## 37	4920d35f-624a-45cc-9c75-dac8f9f1d9f8	NIWO_063.basePlot.ltr	D13	NIWO
## 38	a1afcbb7-add9-4dd5-8feb-1b0a5e295fed	NIWO_063.basePlot.ltr	D13	NIWO
## 39	9cf0463e-c60b-4619-8658-2ed071ae3dcd	NIWO_063.basePlot.ltr	D13	NIWO
## 40	73a932ba-e4c5-4ca7-9f19-8d34ef1dea5a	NIWO_063.basePlot.ltr	D13	NIWO
## 41	a94addfa-17fc-47cb-8d69-4af3903c8bec	NIWO_063.basePlot.ltr	D13	NIWO
## 42	51b709df-af0d-441c-8835-b4bf2251ac17	NIWO_041.basePlot.ltr	D13	NIWO
## 43	cb0eb445-e514-468e-bcad-b6b4ae52ccba	NIWO_041.basePlot.ltr	D13	NIWO
## 44	f7188915-7307-4a91-b71c-7e3ff38f7d0b	NIWO_041.basePlot.ltr	D13	NIWO
## 45	c5b62b0f-e753-40e0-8cf3-e78d8a2c6c8a	NIWO_041.basePlot.ltr	D13	NIWO
## 46	85a503a8-6817-4513-8a64-d780842d6947	NIWO_041.basePlot.ltr	D13	NIWO
## 47	1b049f51-fbda-4b62-83fb-652da4308f5a	NIWO_041.basePlot.ltr	D13	NIWO
## 48	3f0a9383-16f4-4197-808c-55ac449b952d	NIWO_047.basePlot.ltr	D13	NIWO
## 49	25fff36f-f181-4f62-8529-b419227909d2	NIWO_047.basePlot.ltr	D13	NIWO
## 50	ce1f0639-26a8-4a90-9df5-39549bfa412b	NIWO_047.basePlot.ltr	D13	NIWO
## 51	028eea3d-5c20-4afc-bb7e-a05bab305152	NIWO_047.basePlot.ltr	D13	NIWO
## 52	89f98b92-bbc5-4a43-a852-46db48f6b16f	NIWO_047.basePlot.ltr	D13	NIWO
## 53	fc47bdf8-99aa-4289-9158-6ebe5b4ccb06	NIWO_047.basePlot.ltr	D13	NIWO
## 54	88ae9d88-44fd-4ef3-ba99-bd5c0590b507	NIWO_047.basePlot.ltr	D13	NIWO

## 55	7dd99eca-b6ef-42f7-8ce1-672c1d4626a5	NIWO_047.basePlot.ltr	D13	NIWO
## 56	0cbcd7ab-3995-49c8-8a36-6361dee82bc6	NIWO_051.basePlot.ltr	D13	NIWO
## 57	2a87c5aa-60ab-4ba1-afe5-24e0b52aa7d8	NIWO_051.basePlot.ltr	D13	NIWO
## 58	491fba9a-a682-4f7c-ac22-5b01b759f734	NIWO_051.basePlot.ltr	D13	NIWO
## 59	ba4d7a74-4570-4317-bea1-69a81b8083bf	NIWO_051.basePlot.ltr	D13	NIWO
## 60	cbf183ba-6177-4afc-88d6-328f37fd57d4	NIWO_051.basePlot.ltr	D13	NIWO
## 61	77a0a09f-c819-4e54-b322-0529fa585d02	NIWO_051.basePlot.ltr	D13	NIWO
## 62	e5bbc4fc-92d5-4fab-b151-3e9655678e65	NIWO_051.basePlot.ltr	D13	NIWO
## 63	0a6cae78-ea42-4e68-98c6-9d929068a38a	NIWO_058.basePlot.ltr	D13	NIWO
## 64	80263145-05ab-4b6c-93d3-b058fd56a044	NIWO_058.basePlot.ltr	D13	NIWO
## 65	fe503f47-15a6-497f-b7dc-b865099d0faa	NIWO_058.basePlot.ltr	D13	NIWO
## 66	76676d6a-bdd4-4764-b56f-1e8abd242d62	NIWO_058.basePlot.ltr	D13	NIWO
## 67	3eb148f7-219b-43ba-9d39-7c9ea4c6f569	NIWO_058.basePlot.ltr	D13	NIWO
## 68	fbcb280eb-cd64-41d6-bb82-616d9b11a8a5	NIWO_058.basePlot.ltr	D13	NIWO
## 69	63867744-5cd5-4c61-96f1-e6522ea3ef55	NIWO_058.basePlot.ltr	D13	NIWO
## 70	ea74be18-c9ce-4708-8ad6-513be0e66a22	NIWO_058.basePlot.ltr	D13	NIWO
## 71	3933adbb-6a03-4a7b-b87f-74af1fd92b50	NIWO_058.basePlot.ltr	D13	NIWO
## 72	c6a43776-e89f-463b-b27a-fa7b5de8a334	NIWO_063.basePlot.ltr	D13	NIWO
## 73	b209072a-dc98-480b-b41c-1da05d97a137	NIWO_063.basePlot.ltr	D13	NIWO
## 74	9812f8f1-25bf-4b29-8a51-5762e99b7578	NIWO_046.basePlot.ltr	D13	NIWO
## 75	d2c18392-2022-4984-86e1-290749d371bc	NIWO_046.basePlot.ltr	D13	NIWO
## 76	324775a3-4799-4496-b545-8770724212ed	NIWO_046.basePlot.ltr	D13	NIWO
## 77	47c666c6-577b-4de5-90d1-972eb7dd7820	NIWO_046.basePlot.ltr	D13	NIWO
## 78	3195d37b-860c-400e-ab26-3cf08f034563	NIWO_046.basePlot.ltr	D13	NIWO
## 79	aa7ef4c5-da6d-4455-8761-730dd4135191	NIWO_046.basePlot.ltr	D13	NIWO
## 80	38e221c3-5011-4d73-aa99-8127154ddd0c	NIWO_046.basePlot.ltr	D13	NIWO
## 81	f8ef9082-9281-4c65-862c-f2696da58e2a	NIWO_046.basePlot.ltr	D13	NIWO
## 82	b6582d1e-b9c3-4a0d-bb37-aac749b1642e	NIWO_046.basePlot.ltr	D13	NIWO
## 83	3e567fbb-9616-444f-9d13-da894718ecf1	NIWO_046.basePlot.ltr	D13	NIWO
## 84	8c02f879-d03e-4903-9ca8-5d4dbcacac57	NIWO_062.basePlot.ltr	D13	NIWO
## 85	d1dc46e9-052d-4638-bdfd-840a9dc51f44	NIWO_062.basePlot.ltr	D13	NIWO
## 86	33aa6853-b3fd-4321-b8f0-9aa144867d6b	NIWO_062.basePlot.ltr	D13	NIWO
## 87	78c8dd41-483f-4f1d-9d35-0b775d0901f2	NIWO_062.basePlot.ltr	D13	NIWO
## 88	9a6bc315-d122-49a6-9817-8288703b1277	NIWO_062.basePlot.ltr	D13	NIWO
## 89	250f0c64-4927-4999-aae6-0d58b1dd7cbf	NIWO_062.basePlot.ltr	D13	NIWO
## 90	11d4f1e8-a7d2-4bb6-b25c-ad8296689ba5	NIWO_062.basePlot.ltr	D13	NIWO
## 91	1ec020ef-5c48-4b39-b6a7-f94f6a739987	NIWO_061.basePlot.ltr	D13	NIWO
## 92	ca636d0d-d049-4e76-be36-4a355a107b6a	NIWO_040.basePlot.ltr	D13	NIWO
## 93	84f9566d-5364-4af7-9981-b94a494dc892	NIWO_041.basePlot.ltr	D13	NIWO
## 94	89a7b052-f348-4967-b79b-bccfb428d44f	NIWO_041.basePlot.ltr	D13	NIWO
## 95	61d57643-995d-482b-ba4a-2fa58d064555	NIWO_041.basePlot.ltr	D13	NIWO
## 96	6785dc11-9504-4fd0-9bbe-9bef31f51218	NIWO_041.basePlot.ltr	D13	NIWO
## 97	0ae1c621-387e-42a9-bcf3-7ad1c9b97ab4	NIWO_041.basePlot.ltr	D13	NIWO
## 98	be20875b-99a3-452e-9102-8a80d59fe527	NIWO_041.basePlot.ltr	D13	NIWO
## 99	e923388d-bcb1-40ad-b48b-514951f98a94	NIWO_041.basePlot.ltr	D13	NIWO
## 100	f67211cc-cfdf-446b-a470-34801aed6539	NIWO_041.basePlot.ltr	D13	NIWO
## 101	30b7312e-690a-41ed-9aa2-4510769172db	NIWO_041.basePlot.ltr	D13	NIWO
## 102	68becebd-7288-4060-86a4-d0d8bfe8967b	NIWO_041.basePlot.ltr	D13	NIWO
## 103	81c5d213-3ed3-44c6-a250-6365b405aaab	NIWO_041.basePlot.ltr	D13	NIWO
## 104	a8f15620-bac0-4c39-8d1d-3351d5647165	NIWO_047.basePlot.ltr	D13	NIWO
## 105	94c59c93-b569-495f-adca-9f711a2a6eb3	NIWO_047.basePlot.ltr	D13	NIWO
## 106	94b4a3e9-bb28-48ee-9098-fb99a22f82aa	NIWO_047.basePlot.ltr	D13	NIWO
## 107	b481266c-37f9-462b-b810-51984d506c8d	NIWO_047.basePlot.ltr	D13	NIWO
## 108	51a2740a-009c-4262-be1f-b8142eebabfc	NIWO_047.basePlot.ltr	D13	NIWO

## 109	65bbf249-f8e4-419a-b5fd-0b597900d074	NIWO_047.basePlot.ltr	D13	NIWO
## 110	a6f6ad8c-3de1-4723-81f0-0e11b98c5b02	NIWO_047.basePlot.ltr	D13	NIWO
## 111	06789d7b-b742-41d9-8556-79d23c193dc0	NIWO_051.basePlot.ltr	D13	NIWO
## 112	bc63b722-e358-486c-9505-9b0bf85dfef4	NIWO_051.basePlot.ltr	D13	NIWO
## 113	81014f97-1cda-49f0-adfc-52b93890bba2	NIWO_051.basePlot.ltr	D13	NIWO
## 114	14b12019-d75f-47e7-a9b9-933a63701168	NIWO_051.basePlot.ltr	D13	NIWO
## 115	5fb584f4-e59e-488d-8337-8495e43f3fc0	NIWO_051.basePlot.ltr	D13	NIWO
## 116	1868228c-b789-4ed1-a688-d6b19fcdcf31	NIWO_051.basePlot.ltr	D13	NIWO
## 117	74cde2d3-9540-4012-bc2a-341b5385d59e	NIWO_051.basePlot.ltr	D13	NIWO
## 118	c13adcbc-da15-4a50-a2ee-fcc81c3722cf	NIWO_058.basePlot.ltr	D13	NIWO
## 119	1ec4b7ae-7690-48b8-8524-ee1e1ab18992	NIWO_058.basePlot.ltr	D13	NIWO
## 120	1ac9e884-e1f8-4138-919b-d295cfa1a215	NIWO_058.basePlot.ltr	D13	NIWO
## 121	7ccd74d3-fee9-4ff9-8fdb-6aaa1ae857b	NIWO_058.basePlot.ltr	D13	NIWO
## 122	36f4f5c4-4a49-43f7-bb4f-4290361e5674	NIWO_058.basePlot.ltr	D13	NIWO
## 123	f52fb766-633a-4141-bd66-fb13dbfddb0a	NIWO_058.basePlot.ltr	D13	NIWO
## 124	dd4fb81c-682e-47b5-b698-2186bc1e01be	NIWO_058.basePlot.ltr	D13	NIWO
## 125	e79a0db0-a9da-47bb-9cce-fd50084e1edc	NIWO_063.basePlot.ltr	D13	NIWO
## 126	32bd2f37-1274-4c59-95f6-2c7a7c04c814	NIWO_063.basePlot.ltr	D13	NIWO
## 127	72d1615a-c544-4165-9bdc-dfafa6914a76	NIWO_063.basePlot.ltr	D13	NIWO
## 128	aa743782-0a16-4ae8-9891-8c82ee443fc0	NIWO_063.basePlot.ltr	D13	NIWO
## 129	b57cc043-c38c-44ab-9b74-722a5a6bef98	NIWO_063.basePlot.ltr	D13	NIWO
## 130	ff27be98-6c8e-440b-8bc6-6b2aae7414d9	NIWO_063.basePlot.ltr	D13	NIWO
## 131	cd691903-631f-40bf-9e89-f895e6e81ca0	NIWO_063.basePlot.ltr	D13	NIWO
## 132	480726a3-d83f-4144-a35d-ab986c85512c	NIWO_046.basePlot.ltr	D13	NIWO
## 133	f0e67fb7-03a9-477a-af89-43e1b4f80a8b	NIWO_046.basePlot.ltr	D13	NIWO
## 134	1de997a7-2d93-4d99-950d-b374cc71d64d	NIWO_046.basePlot.ltr	D13	NIWO
## 135	1fb74156-86e2-4b59-a8ab-ff0a1dcd4e45	NIWO_046.basePlot.ltr	D13	NIWO
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## 139	c33d2042-6a5b-4c47-8f7f-e516f1781539	NIWO_046.basePlot.ltr	D13	NIWO
## 140	652a84e7-5004-465f-afd5-c42a5690c7c8	NIWO_062.basePlot.ltr	D13	NIWO
## 141	8b4b0878-e627-44a6-97d7-be404cc3c1f3	NIWO_062.basePlot.ltr	D13	NIWO
## 142	86071f09-1d00-44b8-a6d5-506d0fdc0571	NIWO_062.basePlot.ltr	D13	NIWO
## 143	368a8fb4-4955-4547-833a-3113f8e0a37a	NIWO_062.basePlot.ltr	D13	NIWO
## 144	0b274782-8e52-4f6a-bb17-36daa821f929	NIWO_062.basePlot.ltr	D13	NIWO
## 145	3edbccc1-9e9c-4af9-8ff4-89f05ca76309	NIWO_062.basePlot.ltr	D13	NIWO
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## 155	647d3e0c-5479-4dc6-80ff-a421e58d4892	NIWO_064.basePlot.ltr	D13	NIWO
## 156	58b99e74-2267-4f04-99a5-1d5850502a7b	NIWO_064.basePlot.ltr	D13	NIWO
## 157	1ace6e31-6078-413a-9ccf-97ab249f2469	NIWO_064.basePlot.ltr	D13	NIWO
## 158	f1a11408-0c9d-4071-813e-3f03d71a98d7	NIWO_064.basePlot.ltr	D13	NIWO
## 159	f96bad2d-73b0-4319-82be-d8a180d0ef72	NIWO_064.basePlot.ltr	D13	NIWO
## 160	28e788d5-7b1f-4873-b173-79582bdc73b4	NIWO_064.basePlot.ltr	D13	NIWO
## 161	e4a1d2cd-0eb4-4e7c-8dab-925ee15e7c97	NIWO_064.basePlot.ltr	D13	NIWO
## 162	c847a531-666b-4271-9675-b3e6a4a9ebb4	NIWO_064.basePlot.ltr	D13	NIWO

## 163	729390b7-45a6-4b78-a568-ac5b2d01fd6d	NIWO_057.basePlot.ltr	D13	NIWO		
## 164	a424b04b-bdd7-4432-96be-1c4f7618c5a3	NIWO_057.basePlot.ltr	D13	NIWO		
## 165	3803299c-3849-4efe-8b58-1944a97dbbf1	NIWO_057.basePlot.ltr	D13	NIWO		
## 166	424d28fc-f70d-4e33-b540-89d1dcfe61aa	NIWO_057.basePlot.ltr	D13	NIWO		
## 167	a06569ed-afbc-4cb5-9a62-c3d03ed10f0c	NIWO_057.basePlot.ltr	D13	NIWO		
## 168	50ebc822-1a19-4741-81ca-93ce060c8381	NIWO_057.basePlot.ltr	D13	NIWO		
## 169	efeba585-efea-4fda-9b26-5c47c2725f8d	NIWO_057.basePlot.ltr	D13	NIWO		
## 170	55afd7c2-ebf7-4581-a4c2-76af701a13da	NIWO_057.basePlot.ltr	D13	NIWO		
## 171	e5e3eb9e-5813-448d-8b62-160d50634251	NIWO_067.basePlot.ltr	D13	NIWO		
## 172	62b2bb98-cf97-4444-ba3e-b608c799e378	NIWO_067.basePlot.ltr	D13	NIWO		
## 173	1c833228-0664-4237-abed-ecfbe4fc14f8	NIWO_067.basePlot.ltr	D13	NIWO		
## 174	dfd5b756-bfed-457f-af58-fbcc88d67690	NIWO_067.basePlot.ltr	D13	NIWO		
## 175	adee8e06-a895-4eb8-9dfd-baaf7198efbc	NIWO_067.basePlot.ltr	D13	NIWO		
## 176	b4b0d964-8f8a-499c-b741-bf370d598fcc	NIWO_067.basePlot.ltr	D13	NIWO		
## 177	a839c806-7344-4727-b36f-24a109589729	NIWO_067.basePlot.ltr	D13	NIWO		
## 178	e48b40e8-f16c-4dd6-bea9-7c64efe27202	NIWO_067.basePlot.ltr	D13	NIWO		
## 179	f6aaf2c1-9555-41ca-9101-5eaea74d6639	NIWO_067.basePlot.ltr	D13	NIWO		
## 180	7cda3549-f9e6-4f46-8f5c-f16406a52b50	NIWO_040.basePlot.ltr	D13	NIWO		
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## 182	89f1d431-0743-4504-9e5e-be3b39c44875	NIWO_040.basePlot.ltr	D13	NIWO		
## 183	ebeec5a0-815d-4f3d-a94f-759cca792b11	NIWO_040.basePlot.ltr	D13	NIWO		
## 184	d91a07ab-0da7-4182-9e61-a04d01612f83	NIWO_040.basePlot.ltr	D13	NIWO		
## 185	cc4285fd-d7cf-40b1-9f67-27aa04b502c3	NIWO_040.basePlot.ltr	D13	NIWO		
## 186	93f8312d-c181-4613-80af-4d081b29bf0d	NIWO_040.basePlot.ltr	D13	NIWO		
## 187	5b7c6e0e-40c8-4bc6-b509-a760cbe1a5e4	NIWO_040.basePlot.ltr	D13	NIWO		
## 188	6de90fcf-901c-44c1-88b9-424c92df8c06	NIWO_040.basePlot.ltr	D13	NIWO		
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## 9	NIWO_064	NIWO_064_103	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 10	NIWO_064	NIWO_064_103	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 11	NIWO_064	NIWO_064_103	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 12	NIWO_064	NIWO_064_103	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 13	NIWO_064	NIWO_064_103	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 14	NIWO_064	NIWO_064_103	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 15	NIWO_064	NIWO_064_103	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 16	NIWO_064	NIWO_064_103	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 17	NIWO_067	NIWO_067_017	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 18	NIWO_067	NIWO_067_017	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 19	NIWO_067	NIWO_067_017	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 20	NIWO_067	NIWO_067_017	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 21	NIWO_067	NIWO_067_017	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 22	NIWO_067	NIWO_067_017	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 23	NIWO_067	NIWO_067_017	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 24	NIWO_067	NIWO_067_017	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 25	NIWO_040	NIWO_040_205	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
## 26	NIWO_040	NIWO_040_205	2018-08-06	2018-07-05	<NA>	2018-08-02T21:00Z
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##          massSampleID samplingProtocolVersion functionalGroup
## 1  NEON.LTR.NIW0061169.20180802.TWI      NEON.DOC.001710vE  Twigs/branches
## 2  NEON.LTR.NIW0061169.20180802.SDS      NEON.DOC.001710vE      Seeds
## 3  NEON.LTR.NIW0061169.20180802.WDY      NEON.DOC.001710vE  Woody material
## 4  NEON.LTR.NIW0061169.20180802.FLR      NEON.DOC.001710vE    Flowers
## 5  NEON.LTR.NIW0061169.20180802.WDY      NEON.DOC.001710vE  Woody material
## 6  NEON.LTR.NIW0061169.20180802.NDL      NEON.DOC.001710vE    Needles
## 7  NEON.LTR.NIW0061169.20180802.OTH      NEON.DOC.001710vE    Other
## 8  NEON.LTR.NIW0061169.20180802.LVS      NEON.DOC.001710vE    Leaves
## 9  NEON.LTR.NIW0064103.20180802.FLR      NEON.DOC.001710vE    Flowers
## 10 NEON.LTR.NIW0064103.20180802.WDY      NEON.DOC.001710vE  Woody material
## 11 NEON.LTR.NIW0064103.20180802.WDY      NEON.DOC.001710vE  Woody material
## 12 NEON.LTR.NIW0064103.20180802.LVS      NEON.DOC.001710vE    Leaves
## 13 NEON.LTR.NIW0064103.20180802.TWI      NEON.DOC.001710vE  Twigs/branches
## 14 NEON.LTR.NIW0064103.20180802.OTH      NEON.DOC.001710vE    Other
## 15 NEON.LTR.NIW0064103.20180802.SDS      NEON.DOC.001710vE    Seeds
## 16 NEON.LTR.NIW0064103.20180802.NDL      NEON.DOC.001710vE    Needles
## 17 NEON.LTR.NIW0067017.20180802.LVS      NEON.DOC.001710vE    Leaves
## 18 NEON.LTR.NIW0067017.20180802.FLR      NEON.DOC.001710vE    Flowers
## 19 NEON.LTR.NIW0067017.20180802.OTH      NEON.DOC.001710vE    Other
## 20 NEON.LTR.NIW0067017.20180802.WDY      NEON.DOC.001710vE  Woody material
## 21 NEON.LTR.NIW0067017.20180802.TWI      NEON.DOC.001710vE  Twigs/branches
## 22 NEON.LTR.NIW0067017.20180802.NDL      NEON.DOC.001710vE    Needles
## 23 NEON.LTR.NIW0067017.20180802.MXT      NEON.DOC.001710vE    Mixed
## 24 NEON.LTR.NIW0067017.20180802.SDS      NEON.DOC.001710vE    Seeds
## 25 NEON.LTR.NIW0040205.20180802.OTH      NEON.DOC.001710vE    Other
## 26 NEON.LTR.NIW0040205.20180802.LVS      NEON.DOC.001710vE    Leaves
## 27 NEON.LTR.NIW0040205.20180802.TWI      NEON.DOC.001710vE  Twigs/branches

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## 28	NEON.LTR.NIW0040205.20180802.MXT	NEON.DOC.001710vE	Mixed
## 29	NEON.LTR.NIW0040205.20180802.WDY	NEON.DOC.001710vE	Woody material
## 30	NEON.LTR.NIW0040205.20180802.NDL	NEON.DOC.001710vE	Needles
## 31	NEON.LTR.NIW0040205.20180802.FLR	NEON.DOC.001710vE	Flowers
## 32	NEON.LTR.NIW0040205.20180802.MXT	NEON.DOC.001710vE	Mixed
## 33	NEON.LTR.NIW0040205.20180802.NDL	NEON.DOC.001710vE	Needles
## 34	NEON.LTR.NIW0040205.20180802.SDS	NEON.DOC.001710vE	Seeds
## 35	NEON.LTR.NIW0041059.20180802.MXT	NEON.DOC.001710vE	Mixed
## 36	NEON.LTR.NIW0041059.20180802.SDS	NEON.DOC.001710vE	Seeds
## 37	NEON.LTR.NIW0063062.20180802.WDY	NEON.DOC.001710vE	Woody material
## 38	NEON.LTR.NIW0063062.20180802.NDL	NEON.DOC.001710vE	Needles
## 39	NEON.LTR.NIW0063062.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 40	NEON.LTR.NIW0063062.20180802.LVS	NEON.DOC.001710vE	Leaves
## 41	NEON.LTR.NIW0063062.20180802.SDS	NEON.DOC.001710vE	Seeds
## 42	NEON.LTR.NIW0041059.20180802.FLR	NEON.DOC.001710vE	Flowers
## 43	NEON.LTR.NIW0041059.20180802.NDL	NEON.DOC.001710vE	Needles
## 44	NEON.LTR.NIW0041059.20180802.WDY	NEON.DOC.001710vE	Woody material
## 45	NEON.LTR.NIW0041059.20180802.OTH	NEON.DOC.001710vE	Other
## 46	NEON.LTR.NIW0041059.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 47	NEON.LTR.NIW0041059.20180802.LVS	NEON.DOC.001710vE	Leaves
## 48	NEON.LTR.NIW0047197.20180802.LVS	NEON.DOC.001710vE	Leaves
## 49	NEON.LTR.NIW0047197.20180802.WDY	NEON.DOC.001710vE	Woody material
## 50	NEON.LTR.NIW0047197.20180802.NDL	NEON.DOC.001710vE	Needles
## 51	NEON.LTR.NIW0047197.20180802.FLR	NEON.DOC.001710vE	Flowers
## 52	NEON.LTR.NIW0047197.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 53	NEON.LTR.NIW0047197.20180802.LVS	NEON.DOC.001710vE	Leaves
## 54	NEON.LTR.NIW0047197.20180802.OTH	NEON.DOC.001710vE	Other
## 55	NEON.LTR.NIW0047197.20180802.SDS	NEON.DOC.001710vE	Seeds
## 56	NEON.LTR.NIW0051045.20180802.LVS	NEON.DOC.001710vE	Leaves
## 57	NEON.LTR.NIW0051045.20180802.OTH	NEON.DOC.001710vE	Other
## 58	NEON.LTR.NIW0051045.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 59	NEON.LTR.NIW0051045.20180802.NDL	NEON.DOC.001710vE	Needles
## 60	NEON.LTR.NIW0051045.20180802.WDY	NEON.DOC.001710vE	Woody material
## 61	NEON.LTR.NIW0051045.20180802.FLR	NEON.DOC.001710vE	Flowers
## 62	NEON.LTR.NIW0051045.20180802.SDS	NEON.DOC.001710vE	Seeds
## 63	NEON.LTR.NIW0058101.20180802.WDY	NEON.DOC.001710vE	Woody material
## 64	NEON.LTR.NIW0058101.20180802.NDL	NEON.DOC.001710vE	Needles
## 65	NEON.LTR.NIW0058101.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 66	NEON.LTR.NIW0058101.20180802.NDL	NEON.DOC.001710vE	Needles
## 67	NEON.LTR.NIW0058101.20180802.OTH	NEON.DOC.001710vE	Other
## 68	NEON.LTR.NIW0058101.20180802.FLR	NEON.DOC.001710vE	Flowers
## 69	NEON.LTR.NIW0058101.20180802.LVS	NEON.DOC.001710vE	Leaves
## 70	NEON.LTR.NIW0058101.20180802.SDS	NEON.DOC.001710vE	Seeds
## 71	NEON.LTR.NIW0058101.20180802.OTH	NEON.DOC.001710vE	Other
## 72	NEON.LTR.NIW0063062.20180802.OTH	NEON.DOC.001710vE	Other
## 73	NEON.LTR.NIW0063062.20180802.FLR	NEON.DOC.001710vE	Flowers
## 74	NEON.LTR.NIW0046155.20180802.NDL	NEON.DOC.001710vE	Needles
## 75	NEON.LTR.NIW0046155.20180802.LVS	NEON.DOC.001710vE	Leaves
## 76	NEON.LTR.NIW0046155.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 77	NEON.LTR.NIW0046155.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 78	NEON.LTR.NIW0046155.20180802.MXT	NEON.DOC.001710vE	Mixed
## 79	NEON.LTR.NIW0046155.20180802.OTH	NEON.DOC.001710vE	Other
## 80	NEON.LTR.NIW0046155.20180802.NDL	NEON.DOC.001710vE	Needles
## 81	NEON.LTR.NIW0046155.20180802.WDY	NEON.DOC.001710vE	Woody material

## 82	NEON.LTR.NIW0046155.20180802.FLR	NEON.DOC.001710vE	Flowers
## 83	NEON.LTR.NIW0046155.20180802.SDS	NEON.DOC.001710vE	Seeds
## 84	NEON.LTR.NIW0062050.20180802.SDS	NEON.DOC.001710vE	Seeds
## 85	NEON.LTR.NIW0062050.20180802.TWI	NEON.DOC.001710vE	Twigs/branches
## 86	NEON.LTR.NIW0062050.20180802.FLR	NEON.DOC.001710vE	Flowers
## 87	NEON.LTR.NIW0062050.20180802.LVS	NEON.DOC.001710vE	Leaves
## 88	NEON.LTR.NIW0062050.20180802.OTH	NEON.DOC.001710vE	Other
## 89	NEON.LTR.NIW0062050.20180802.NDL	NEON.DOC.001710vE	Needles
## 90	NEON.LTR.NIW0062050.20180802.WDY	NEON.DOC.001710vE	Woody material
## 91	NEON.LTR.NIW0061169.20180802.NDL	NEON.DOC.001710vE	Needles
## 92	NEON.LTR.NIW0040205.20180830.MXT	NEON.DOC.001710vE	Mixed
## 93	NEON.LTR.NIW0041059.20180830.LVS	NEON.DOC.001710vE	Leaves
## 94	NEON.LTR.NIW0041059.20180830.NDL	NEON.DOC.001710vE	Needles
## 95	NEON.LTR.NIW0041059.20180830.FLR	NEON.DOC.001710vE	Flowers
## 96	NEON.LTR.NIW0041059.20180830.SDS	NEON.DOC.001710vE	Seeds
## 97	NEON.LTR.NIW0041059.20180830.MXT	NEON.DOC.001710vE	Mixed
## 98	NEON.LTR.NIW0041059.20180830.OTH	NEON.DOC.001710vE	Other
## 99	NEON.LTR.NIW0041059.20180830.MXT	NEON.DOC.001710vE	Mixed
## 100	NEON.LTR.NIW0041059.20180830.WDY	NEON.DOC.001710vE	Woody material
## 101	NEON.LTR.NIW0041059.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 102	NEON.LTR.NIW0041059.20180830.NDL	NEON.DOC.001710vE	Needles
## 103	NEON.LTR.NIW0041059.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 104	NEON.LTR.NIW0047197.20180830.OTH	NEON.DOC.001710vE	Other
## 105	NEON.LTR.NIW0047197.20180830.SDS	NEON.DOC.001710vE	Seeds
## 106	NEON.LTR.NIW0047197.20180830.LVS	NEON.DOC.001710vE	Leaves
## 107	NEON.LTR.NIW0047197.20180830.FLR	NEON.DOC.001710vE	Flowers
## 108	NEON.LTR.NIW0047197.20180830.NDL	NEON.DOC.001710vE	Needles
## 109	NEON.LTR.NIW0047197.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 110	NEON.LTR.NIW0047197.20180830.WDY	NEON.DOC.001710vE	Woody material
## 111	NEON.LTR.NIW0051045.20180830.SDS	NEON.DOC.001710vE	Seeds
## 112	NEON.LTR.NIW0051045.20180830.OTH	NEON.DOC.001710vE	Other
## 113	NEON.LTR.NIW0051045.20180830.NDL	NEON.DOC.001710vE	Needles
## 114	NEON.LTR.NIW0051045.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 115	NEON.LTR.NIW0051045.20180830.LVS	NEON.DOC.001710vE	Leaves
## 116	NEON.LTR.NIW0051045.20180830.WDY	NEON.DOC.001710vE	Woody material
## 117	NEON.LTR.NIW0051045.20180830.FLR	NEON.DOC.001710vE	Flowers
## 118	NEON.LTR.NIW0058101.20180830.WDY	NEON.DOC.001710vE	Woody material
## 119	NEON.LTR.NIW0058101.20180830.OTH	NEON.DOC.001710vE	Other
## 120	NEON.LTR.NIW0058101.20180830.SDS	NEON.DOC.001710vE	Seeds
## 121	NEON.LTR.NIW0058101.20180830.FLR	NEON.DOC.001710vE	Flowers
## 122	NEON.LTR.NIW0058101.20180830.NDL	NEON.DOC.001710vE	Needles
## 123	NEON.LTR.NIW0058101.20180830.LVS	NEON.DOC.001710vE	Leaves
## 124	NEON.LTR.NIW0058101.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 125	NEON.LTR.NIW0063062.20180830.SDS	NEON.DOC.001710vE	Seeds
## 126	NEON.LTR.NIW0063062.20180830.NDL	NEON.DOC.001710vE	Needles
## 127	NEON.LTR.NIW0063062.20180830.LVS	NEON.DOC.001710vE	Leaves
## 128	NEON.LTR.NIW0063062.20180830.FLR	NEON.DOC.001710vE	Flowers
## 129	NEON.LTR.NIW0063062.20180830.WDY	NEON.DOC.001710vE	Woody material
## 130	NEON.LTR.NIW0063062.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 131	NEON.LTR.NIW0063062.20180830.OTH	NEON.DOC.001710vE	Other
## 132	NEON.LTR.NIW0046155.20180830.LVS	NEON.DOC.001710vE	Leaves
## 133	NEON.LTR.NIW0046155.20180830.NDL	NEON.DOC.001710vE	Needles
## 134	NEON.LTR.NIW0046155.20180830.OTH	NEON.DOC.001710vE	Other
## 135	NEON.LTR.NIW0046155.20180830.WDY	NEON.DOC.001710vE	Woody material

## 136	NEON.LTR.NIW0046155.20180830.SDS	NEON.DOC.001710vE	Seeds
## 137	NEON.LTR.NIW0046155.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 138	NEON.LTR.NIW0046155.20180830.FLR	NEON.DOC.001710vE	Flowers
## 139	NEON.LTR.NIW0046155.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 140	NEON.LTR.NIW0062050.20180830.SDS	NEON.DOC.001710vE	Seeds
## 141	NEON.LTR.NIW0062050.20180830.FLR	NEON.DOC.001710vE	Flowers
## 142	NEON.LTR.NIW0062050.20180830.LVS	NEON.DOC.001710vE	Leaves
## 143	NEON.LTR.NIW0062050.20180830.WDY	NEON.DOC.001710vE	Woody material
## 144	NEON.LTR.NIW0062050.20180830.OTH	NEON.DOC.001710vE	Other
## 145	NEON.LTR.NIW0062050.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 146	NEON.LTR.NIW0062050.20180830.NDL	NEON.DOC.001710vE	Needles
## 147	NEON.LTR.NIW0061169.20180830.OTH	NEON.DOC.001710vE	Other
## 148	NEON.LTR.NIW0061169.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 149	NEON.LTR.NIW0061169.20180830.WDY	NEON.DOC.001710vE	Woody material
## 150	NEON.LTR.NIW0061169.20180830.FLR	NEON.DOC.001710vE	Flowers
## 151	NEON.LTR.NIW0061169.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 152	NEON.LTR.NIW0061169.20180830.SDS	NEON.DOC.001710vE	Seeds
## 153	NEON.LTR.NIW0061169.20180830.LVS	NEON.DOC.001710vE	Leaves
## 154	NEON.LTR.NIW0061169.20180830.NDL	NEON.DOC.001710vE	Needles
## 155	NEON.LTR.NIW0064103.20180830.WDY	NEON.DOC.001710vE	Woody material
## 156	NEON.LTR.NIW0064103.20180830.WDY	NEON.DOC.001710vE	Woody material
## 157	NEON.LTR.NIW0064103.20180830.LVS	NEON.DOC.001710vE	Leaves
## 158	NEON.LTR.NIW0064103.20180830.FLR	NEON.DOC.001710vE	Flowers
## 159	NEON.LTR.NIW0064103.20180830.SDS	NEON.DOC.001710vE	Seeds
## 160	NEON.LTR.NIW0064103.20180830.OTH	NEON.DOC.001710vE	Other
## 161	NEON.LTR.NIW0064103.20180830.NDL	NEON.DOC.001710vE	Needles
## 162	NEON.LTR.NIW0064103.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 163	NEON.LTR.NIW0057081.20180830.NDL	NEON.DOC.001710vE	Needles
## 164	NEON.LTR.NIW0057081.20180830.FLR	NEON.DOC.001710vE	Flowers
## 165	NEON.LTR.NIW0057081.20180830.SDS	NEON.DOC.001710vE	Seeds
## 166	NEON.LTR.NIW0057081.20180830.OTH	NEON.DOC.001710vE	Other
## 167	NEON.LTR.NIW0057081.20180830.LVS	NEON.DOC.001710vE	Leaves
## 168	NEON.LTR.NIW0057081.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 169	NEON.LTR.NIW0057081.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 170	NEON.LTR.NIW0057081.20180830.WDY	NEON.DOC.001710vE	Woody material
## 171	NEON.LTR.NIW0067017.20180830.NDL	NEON.DOC.001710vE	Needles
## 172	NEON.LTR.NIW0067017.20180830.OTH	NEON.DOC.001710vE	Other
## 173	NEON.LTR.NIW0067017.20180830.LVS	NEON.DOC.001710vE	Leaves
## 174	NEON.LTR.NIW0067017.20180830.WDY	NEON.DOC.001710vE	Woody material
## 175	NEON.LTR.NIW0067017.20180830.NDL	NEON.DOC.001710vE	Needles
## 176	NEON.LTR.NIW0067017.20180830.FLR	NEON.DOC.001710vE	Flowers
## 177	NEON.LTR.NIW0067017.20180830.SDS	NEON.DOC.001710vE	Seeds
## 178	NEON.LTR.NIW0067017.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 179	NEON.LTR.NIW0067017.20180830.MXT	NEON.DOC.001710vE	Mixed
## 180	NEON.LTR.NIW0040205.20180830.SDS	NEON.DOC.001710vE	Seeds
## 181	NEON.LTR.NIW0040205.20180830.WDY	NEON.DOC.001710vE	Woody material
## 182	NEON.LTR.NIW0040205.20180830.OTH	NEON.DOC.001710vE	Other
## 183	NEON.LTR.NIW0040205.20180830.LVS	NEON.DOC.001710vE	Leaves
## 184	NEON.LTR.NIW0040205.20180830.NDL	NEON.DOC.001710vE	Needles
## 185	NEON.LTR.NIW0040205.20180830.TWI	NEON.DOC.001710vE	Twigs/branches
## 186	NEON.LTR.NIW0040205.20180830.MXT	NEON.DOC.001710vE	Mixed
## 187	NEON.LTR.NIW0040205.20180830.NDL	NEON.DOC.001710vE	Needles
## 188	NEON.LTR.NIW0040205.20180830.FLR	NEON.DOC.001710vE	Flowers
##	dryMass qaDryMass remarks	measuredBy	

## 1	0.400	N	NA kstyers@battelleecology.org
## 2	0.005	N	NA kstyers@battelleecology.org
## 3	0.040	Y	NA kstyers@battelleecology.org
## 4	0.005	N	NA kstyers@battelleecology.org
## 5	0.070	N	NA kstyers@battelleecology.org
## 6	1.000	N	NA kstyers@battelleecology.org
## 7	0.200	N	NA kstyers@battelleecology.org
## 8	0.005	N	NA kstyers@battelleecology.org
## 9	0.190	N	NA kstyers@battelleecology.org
## 10	1.180	Y	NA kstyers@battelleecology.org
## 11	1.180	N	NA kstyers@battelleecology.org
## 12	0.000	N	NA kstyers@battelleecology.org
## 13	0.005	N	NA kstyers@battelleecology.org
## 14	0.350	N	NA kstyers@battelleecology.org
## 15	0.000	N	NA kstyers@battelleecology.org
## 16	3.060	N	NA kstyers@battelleecology.org
## 17	0.000	N	NA kstyers@battelleecology.org
## 18	0.005	N	NA kstyers@battelleecology.org
## 19	0.040	N	NA kstyers@battelleecology.org
## 20	0.005	N	NA kstyers@battelleecology.org
## 21	0.005	N	NA kstyers@battelleecology.org
## 22	0.930	N	NA kstyers@battelleecology.org
## 23	0.000	N	NA kstyers@battelleecology.org
## 24	0.005	N	NA kstyers@battelleecology.org
## 25	0.000	N	NA kstyers@battelleecology.org
## 26	0.000	N	NA kstyers@battelleecology.org
## 27	0.720	N	NA kstyers@battelleecology.org
## 28	2.120	Y	NA kstyers@battelleecology.org
## 29	0.000	N	NA kstyers@battelleecology.org
## 30	3.240	N	NA kstyers@battelleecology.org
## 31	0.240	N	NA kstyers@battelleecology.org
## 32	2.170	N	NA kstyers@battelleecology.org
## 33	3.160	Y	NA kstyers@battelleecology.org
## 34	0.000	N	NA kstyers@battelleecology.org
## 35	0.170	N	NA kstyers@battelleecology.org
## 36	0.000	N	NA kstyers@battelleecology.org
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## 38	0.240	N	NA kstyers@battelleecology.org
## 39	0.060	N	NA kstyers@battelleecology.org
## 40	0.000	N	NA kstyers@battelleecology.org
## 41	0.000	N	NA kstyers@battelleecology.org
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## 43	1.790	N	NA kstyers@battelleecology.org
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## 47	0.005	N	NA kstyers@battelleecology.org
## 48	0.005	Y	NA kstyers@battelleecology.org
## 49	0.000	N	NA kstyers@battelleecology.org
## 50	0.030	N	NA kstyers@battelleecology.org
## 51	0.000	N	NA kstyers@battelleecology.org
## 52	0.000	N	NA kstyers@battelleecology.org
## 53	0.005	N	NA kstyers@battelleecology.org
## 54	0.005	N	NA kstyers@battelleecology.org

## 55	0.000	N	NA kstyers@battelleecology.org
## 56	0.000	N	NA kstyers@battelleecology.org
## 57	0.005	N	NA kstyers@battelleecology.org
## 58	0.050	N	NA kstyers@battelleecology.org
## 59	0.470	N	NA kstyers@battelleecology.org
## 60	0.005	N	NA kstyers@battelleecology.org
## 61	0.005	N	NA kstyers@battelleecology.org
## 62	0.000	N	NA kstyers@battelleecology.org
## 63	0.005	N	NA kstyers@battelleecology.org
## 64	1.640	N	NA kstyers@battelleecology.org
## 65	0.000	N	NA kstyers@battelleecology.org
## 66	1.670	Y	NA kstyers@battelleecology.org
## 67	0.005	N	NA kstyers@battelleecology.org
## 68	0.000	N	NA kstyers@battelleecology.org
## 69	0.000	N	NA kstyers@battelleecology.org
## 70	0.000	N	NA kstyers@battelleecology.org
## 71	0.005	Y	NA kstyers@battelleecology.org
## 72	0.005	N	NA kstyers@battelleecology.org
## 73	0.000	N	NA kstyers@battelleecology.org
## 74	3.920	Y	NA kstyers@battelleecology.org
## 75	0.000	N	NA kstyers@battelleecology.org
## 76	0.630	N	NA kstyers@battelleecology.org
## 77	0.630	Y	NA kstyers@battelleecology.org
## 78	0.090	N	NA kstyers@battelleecology.org
## 79	0.000	N	NA kstyers@battelleecology.org
## 80	3.920	N	NA kstyers@battelleecology.org
## 81	0.030	N	NA kstyers@battelleecology.org
## 82	0.020	N	NA kstyers@battelleecology.org
## 83	0.000	N	NA kstyers@battelleecology.org
## 84	0.000	N	NA kstyers@battelleecology.org
## 85	0.000	N	NA kstyers@battelleecology.org
## 86	0.000	N	NA kstyers@battelleecology.org
## 87	0.000	N	NA kstyers@battelleecology.org
## 88	0.080	N	NA kstyers@battelleecology.org
## 89	0.320	N	NA kstyers@battelleecology.org
## 90	0.005	N	NA kstyers@battelleecology.org
## 91	1.000	Y	NA kstyers@battelleecology.org
## 92	0.610	Y	NA szrillo@battelleecology.org
## 93	0.000	N	NA szrillo@battelleecology.org
## 94	8.630	Y	NA szrillo@battelleecology.org
## 95	0.005	N	NA szrillo@battelleecology.org
## 96	0.005	N	NA szrillo@battelleecology.org
## 97	1.910	Y	NA szrillo@battelleecology.org
## 98	0.000	N	NA szrillo@battelleecology.org
## 99	1.900	N	NA szrillo@battelleecology.org
## 100	0.140	N	NA szrillo@battelleecology.org
## 101	0.340	Y	NA szrillo@battelleecology.org
## 102	8.620	N	NA szrillo@battelleecology.org
## 103	0.340	N	NA szrillo@battelleecology.org
## 104	0.005	N	NA szrillo@battelleecology.org
## 105	0.000	N	NA szrillo@battelleecology.org
## 106	0.000	N	NA szrillo@battelleecology.org
## 107	0.000	N	NA szrillo@battelleecology.org
## 108	0.420	N	NA szrillo@battelleecology.org

## 109	0.000	N	NA szrillo@battelleecology.org
## 110	0.005	N	NA szrillo@battelleecology.org
## 111	0.000	N	NA szrillo@battelleecology.org
## 112	0.010	N	NA szrillo@battelleecology.org
## 113	0.900	N	NA szrillo@battelleecology.org
## 114	0.020	N	NA szrillo@battelleecology.org
## 115	0.000	N	NA szrillo@battelleecology.org
## 116	0.005	N	NA szrillo@battelleecology.org
## 117	0.000	N	NA szrillo@battelleecology.org
## 118	0.000	N	NA szrillo@battelleecology.org
## 119	0.005	N	NA szrillo@battelleecology.org
## 120	0.000	N	NA szrillo@battelleecology.org
## 121	0.030	N	NA szrillo@battelleecology.org
## 122	2.820	N	NA szrillo@battelleecology.org
## 123	0.000	N	NA szrillo@battelleecology.org
## 124	0.000	N	NA szrillo@battelleecology.org
## 125	0.000	N	NA szrillo@battelleecology.org
## 126	0.300	N	NA szrillo@battelleecology.org
## 127	0.005	N	NA szrillo@battelleecology.org
## 128	0.005	N	NA szrillo@battelleecology.org
## 129	0.000	N	NA szrillo@battelleecology.org
## 130	0.200	N	NA szrillo@battelleecology.org
## 131	0.000	N	NA szrillo@battelleecology.org
## 132	0.000	N	NA szrillo@battelleecology.org
## 133	7.000	N	NA szrillo@battelleecology.org
## 134	0.110	N	NA szrillo@battelleecology.org
## 135	0.090	N	NA szrillo@battelleecology.org
## 136	0.000	N	NA szrillo@battelleecology.org
## 137	1.050	Y	NA szrillo@battelleecology.org
## 138	0.005	N	NA szrillo@battelleecology.org
## 139	1.050	N	NA szrillo@battelleecology.org
## 140	0.005	N	NA szrillo@battelleecology.org
## 141	0.005	N	NA szrillo@battelleecology.org
## 142	0.060	N	NA szrillo@battelleecology.org
## 143	0.050	N	NA szrillo@battelleecology.org
## 144	0.090	N	NA szrillo@battelleecology.org
## 145	0.000	N	NA szrillo@battelleecology.org
## 146	3.980	N	NA szrillo@battelleecology.org
## 147	0.110	N	NA szrillo@battelleecology.org
## 148	0.060	Y	NA szrillo@battelleecology.org
## 149	0.150	N	NA szrillo@battelleecology.org
## 150	0.060	N	NA szrillo@battelleecology.org
## 151	0.020	N	NA szrillo@battelleecology.org
## 152	0.000	N	NA szrillo@battelleecology.org
## 153	0.000	N	NA szrillo@battelleecology.org
## 154	1.530	N	NA szrillo@battelleecology.org
## 155	0.010	Y	NA szrillo@battelleecology.org
## 156	0.010	N	NA szrillo@battelleecology.org
## 157	0.005	N	NA szrillo@battelleecology.org
## 158	0.110	N	NA szrillo@battelleecology.org
## 159	0.000	N	NA szrillo@battelleecology.org
## 160	0.080	N	NA szrillo@battelleecology.org
## 161	2.820	N	NA szrillo@battelleecology.org
## 162	0.000	N	NA szrillo@battelleecology.org

```
## 163 4.090 N NA szrillo@battelleecology.org
## 164 0.070 N NA szrillo@battelleecology.org
## 165 0.000 N NA szrillo@battelleecology.org
## 166 0.290 N NA szrillo@battelleecology.org
## 167 0.000 N NA szrillo@battelleecology.org
## 168 5.840 N NA szrillo@battelleecology.org
## 169 5.870 Y NA szrillo@battelleecology.org
## 170 0.320 N NA szrillo@battelleecology.org
## 171 2.280 N NA szrillo@battelleecology.org
## 172 0.000 N NA szrillo@battelleecology.org
## 173 0.000 N NA szrillo@battelleecology.org
## 174 0.005 N NA szrillo@battelleecology.org
## 175 2.290 Y NA szrillo@battelleecology.org
## 176 0.005 N NA szrillo@battelleecology.org
## 177 0.000 N NA szrillo@battelleecology.org
## 178 0.150 N NA szrillo@battelleecology.org
## 179 0.070 N NA szrillo@battelleecology.org
## 180 0.005 N NA szrillo@battelleecology.org
## 181 0.980 N NA szrillo@battelleecology.org
## 182 0.000 N NA szrillo@battelleecology.org
## 183 0.000 N NA szrillo@battelleecology.org
## 184 4.550 Y NA szrillo@battelleecology.org
## 185 0.000 N NA szrillo@battelleecology.org
## 186 0.610 N NA szrillo@battelleecology.org
## 187 4.530 N NA szrillo@battelleecology.org
## 188 0.150 N NA szrillo@battelleecology.org
```

```
#188 plots were sampled at Niwot Ridge
#Convert all the characters in Litter to factors
Litternew <-Litter%>%
  mutate_all(as.factor)
#double check outcome from "unique" function
summary(Litternew$siteID)
```

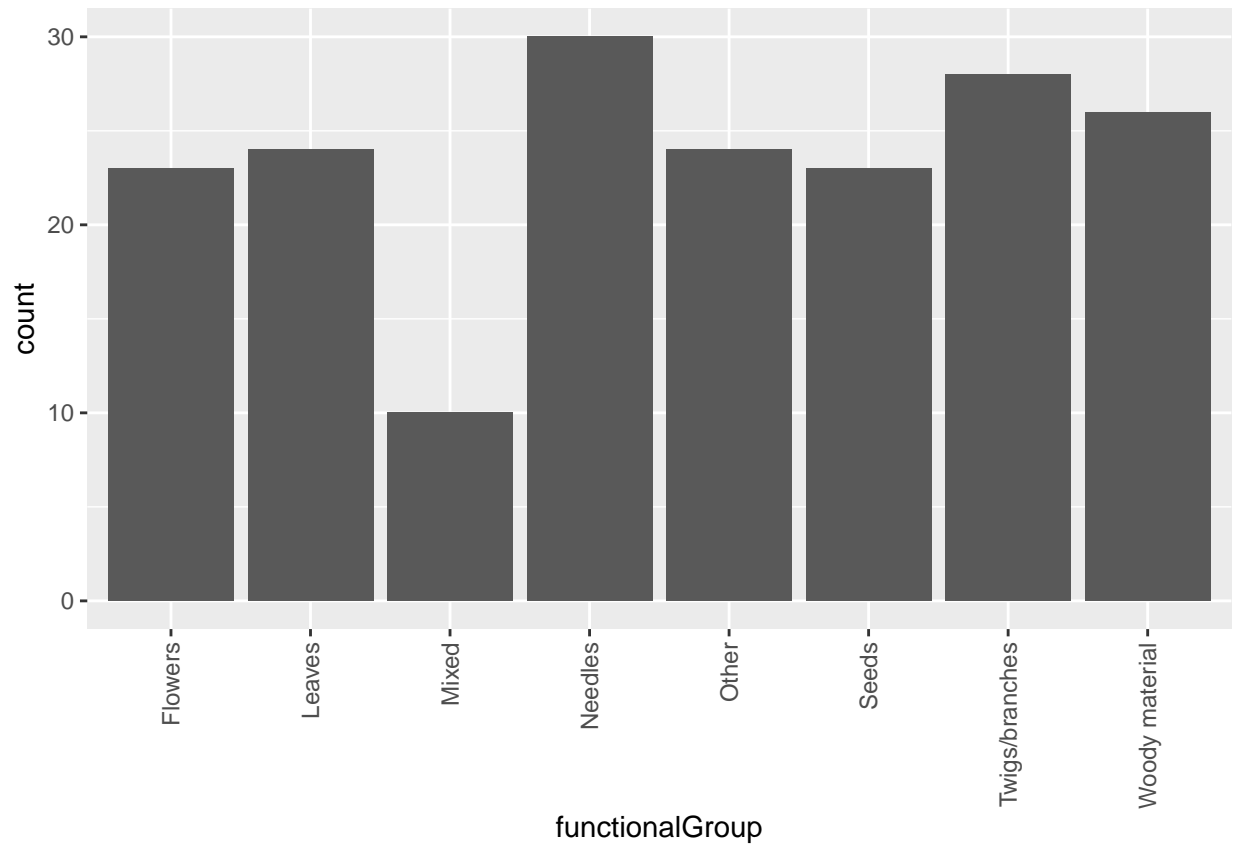
```
## NIWO
## 188
```

```
#188 plots were sampled at Niwot Ridge
```

Answer: The unique function only returns unique rows in a dataframe while the summary function accumulates all unique values across columns based on values from one column in a short condensed manner.

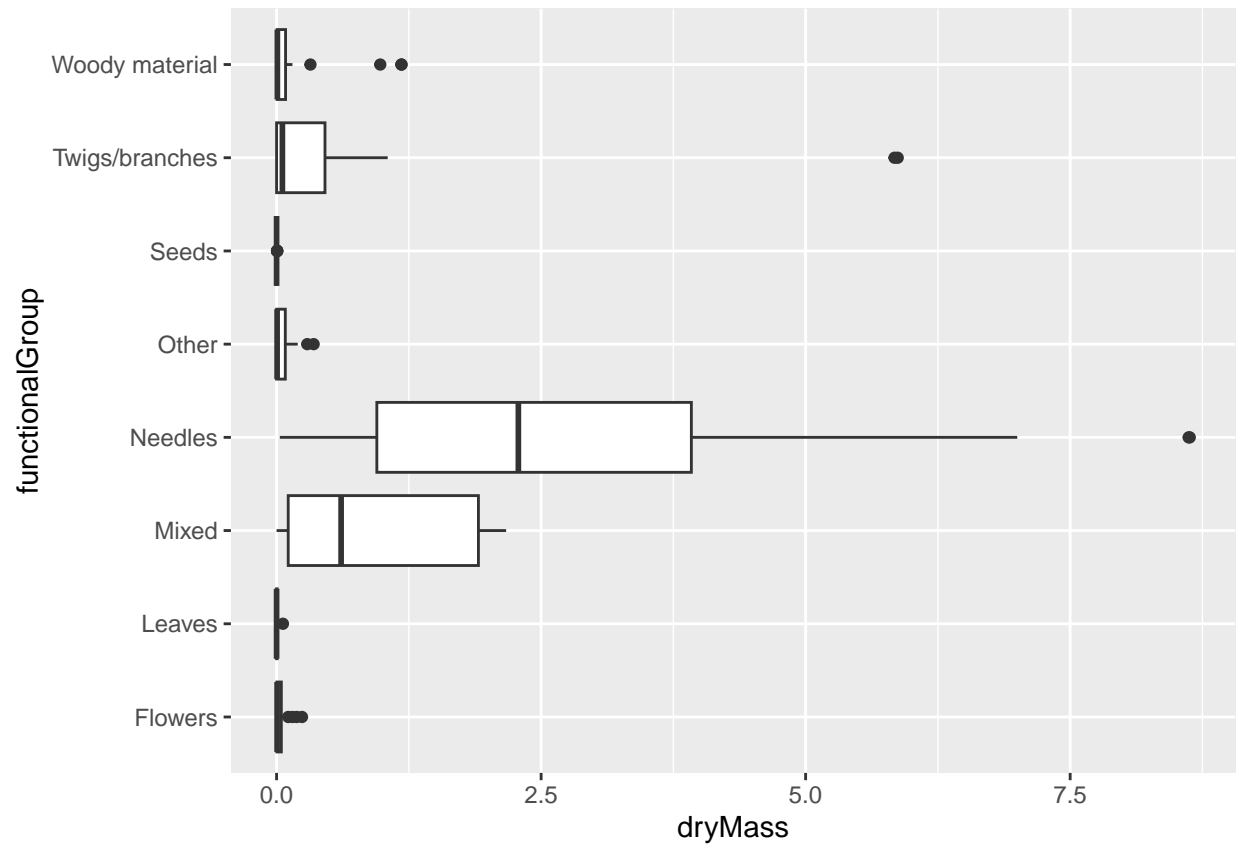
14. Create a bar graph of functionalGroup counts. This shows you what type of litter is collected at the Niwot Ridge sites. Notice that litter types are fairly equally distributed across the Niwot Ridge sites.

```
ggplot(Litter, aes(x = functionalGroup)) +
  geom_bar() + theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust=1))
```

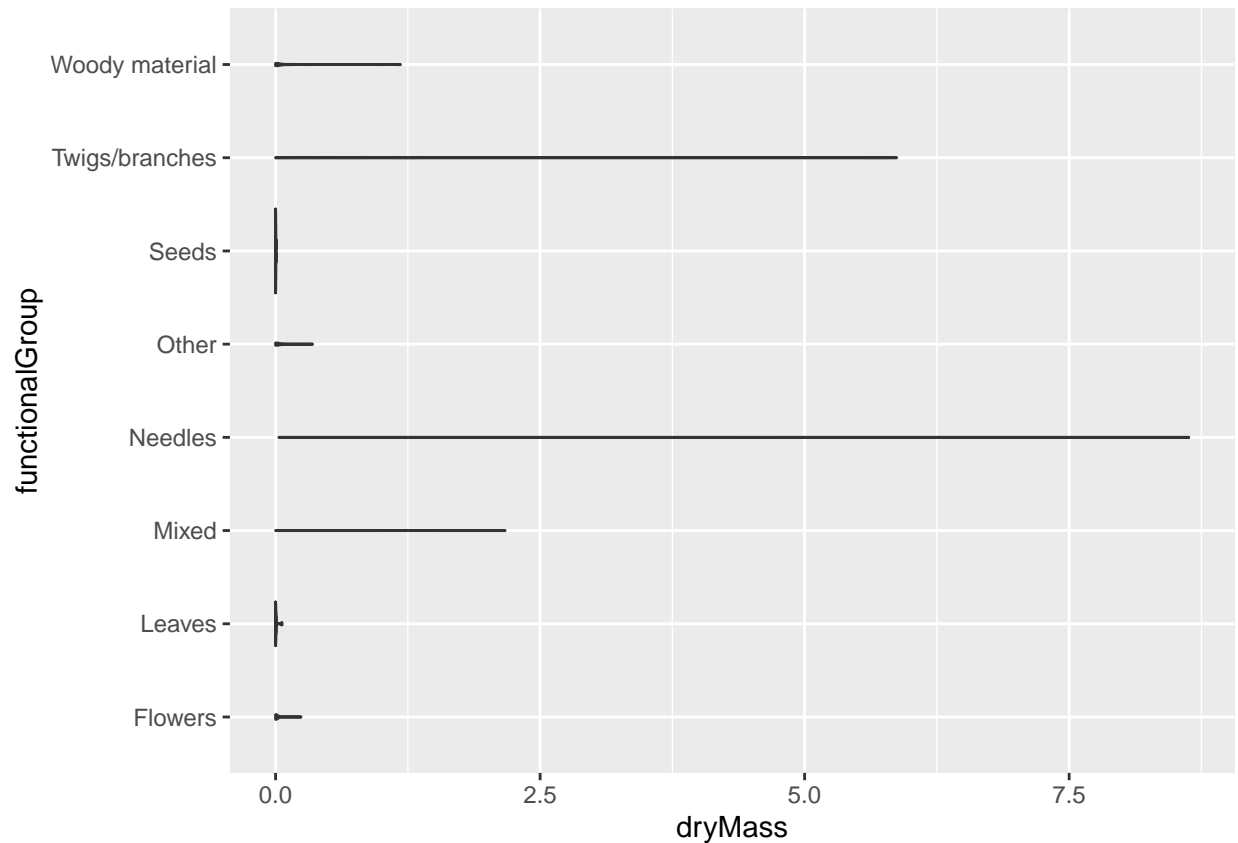



15. Using `geom_boxplot` and `geom_violin`, create a boxplot and a violin plot of `dryMass` by `functionalGroup`.

```
#boxplot of dryMass by functionalGroup  
ggplot(Litter, aes(x = dryMass, y = functionalGroup)) +  
  geom_boxplot()
```



```
#violin plot of dryMass by functionalGroup
ggplot(Litter) +
  geom_violin(aes(x = dryMass, y = functionalGroup), draw_quantiles = c(0.25, 0.5, 0.75))
```



Why is the boxplot a more effective visualization option than the violin plot in this case?

Answer: The boxplot in this case is better at showing the quantiles of the data and as result the overall spread of the data.

What type(s) of litter tend to have the highest biomass at these sites?

Answer: Needles had the highest biomass at these sites and had a very large range of dry mass. Mixed functional groups followed by Twig/branches also had high dry biomass.

““